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ABSTRACT

This trainee handbook is designed for a course to prepare workers with safety competencies in order to meet Kentucky mandatory mine safety requirements before entering mines in Kentucky; it is also intended for workers who have been on the job less than 90 days. The guide is organized into 14 chapters. Topics covered in the mine safety training program include the use of the self-rescue device; introduction to mining; authority and responsibility of supervisors (authority chains); entering and leaving mines; mine map, escapeways, emergency evacuations, and barricading; roof control and ventilation plans; rock dusting, first aid; electrical hazards, moving equipment; accident prevention; explosives; health and safety standards, gases; miners' rights and obligations and federal mine safety laws. Each topic is outlined, illustrated where appropriate, and includes a glossary of terms. (KC)

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Kentucky Mine Safety Training Program

Trainee Handbook

--Underground--

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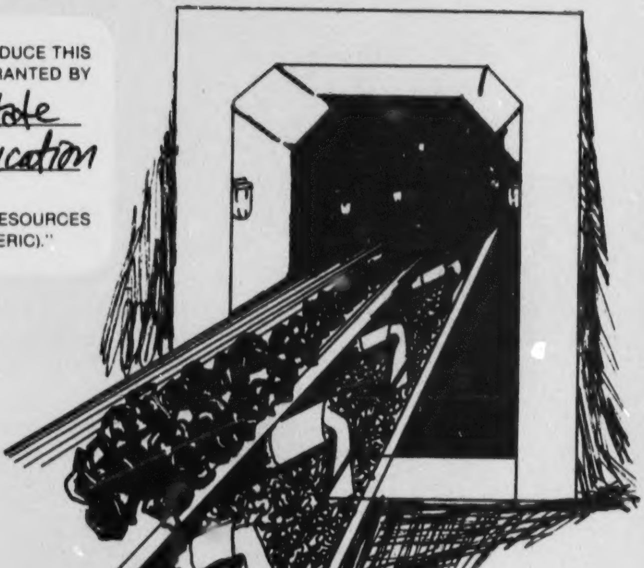

CE030608

Kentucky Department of Education

Sept 1981

A Message from the Superintendent

Raymond Barber,

Superintendent of Public Instruction

Kentucky is dedicated to helping meet the demands of a nation seeking a goal of energy independence. As the number one coal producing state, it has become evident that the industry continually experiences change due to its highly mechanized and technical nature. Educators and coal industry personnel recognize that while experiencing these changes it is imperative that all personnel be highly trained both before and after entering the profession.

The lack of a skilled and experienced work force has been cited as a major cause of the increase in work force injuries and fatalities in recent years. Both the Bureau of Mines Annual Report and the Kentucky Deep Mine Commission Report state that the lack of effective training and knowledge are the major contributors to accidents and fatalities in Kentucky's mines. The Kentucky Mine Safety Training Program will assist personnel in obtaining the specific knowledge and safety skills necessary for entering the mining profession and will be used as a major instructional tool in closing the gap between the untrained, unskilled and a skilled, trained work force.

In order to insure the safety of the total coal mining work force, the Kentucky Mine Safety Training Program has been developed and adopted by the Department of Education, Bureau of Vocational Education. This was achieved through a cooperative effort with the Kentucky Department of Mines and Minerals and the Mining Safety and Health Administration. The program objective is to prepare individual workers with safety competencies in order to meet mandatory safety requirements before entering the profession or for those Kentucky workers who have entered the occupation but have not been employed in the industry an excess of ninety (90) working days. It is highly recommended that all mining work force become competent in all aspects of mining safety. The importance of mine safety is recognized by the Commonwealth of Kentucky as evidenced by the state law that became effective November 1, 1978, which requires forty-eight (48) hours of mine safety training to meet the instructional portion of the certification requirements. This will also fulfill the Mine Safety Health Administration (MSHA) requirement of forty (40) hours of mine safety training.

Vocational Education has accepted the challenge of providing highly skilled, knowledgeable workers who are aware of and can cope with the health and safety hazards inherent in the mining industry. The Mine Safety Training Program will produce individuals who can justifiably feel confident that they and their co-workers have the competencies necessary to insure that the mine is a safe and rewarding place to work.

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PART I

SELF RESCUE DEVICES

PUBLIC PROTECTION AND REGULATION
Department of Mines and Minerals
Division of Miner Training, Education and Certification

RELATES TO: KRS 351.102, 351.105
PURSUANT TO: KRS 13.082, 351.106

NECESSITY AND FUNCTION: KRS 351.106 empowers the Commissioner of the Department of Mines and Minerals to promulgate such reasonable regulations as are necessary to establish a program for miner training and examination according to the criteria and standards established by the Board of Miner Training, Education and Certification. This regulation effects the provisions of that law.

Section 1. Training and Certification of Inexperienced Miners. (1) A permit as trainee miner shall be issued by the Commissioner to any person who has completed a program of education and training that meets all the requirements of this regulation and consists of a minimum of forty-eight (48) hours or who is enrolled in a certified mine technology program.

(2) This training may be received through the Bureau of Vocational Education, mine company programs, private or public institutions of education or any program certified by the Board as meeting the requirements of this regulation.

(3) Upon proof that an inexperienced miner has received the course of instruction set forth in this regulation within twelve (12) months preceding initial employment at a mine, such miner need not repeat the training specified in this regulation.

Section 2. Training Program. The training program for inexperienced miners shall include, but not be limited to, the following courses:

(1) Self-Rescue Devices - The course shall include instruction in the use, care and maintenance of self-rescuer and other respiratory devices. This course shall be given before the inexperienced miner visits, tours or goes underground.

(2) Introduction to Mining - This introduction to mining course should include a visit and tour of a mine or portions of a mine which are representative of the entire mine. The method of mining utilized at the mine (that is conventional, continuous, longwall, or other) should be observed and explained.

(3) Authority and Responsibility of Supervisors - The course shall include review and description of the line of authority of supervisors and the responsibilities of such supervisors, and an introduction to rules and proper procedures for reporting safety hazards.

(4) Entering and Leaving Mines - Transportation, Communication - The course shall include instruction in the procedures in effect for entering and leaving mines, the check-in and check-out systems in effect

at mines, the procedures for riding on and in mine conveyances, the controls in effect for transportation of miners and materials, and the use of mine communication systems, warning signals and directional signs.

(5) Mine Map, Escapeways, Emergency Evacuations and Barricading - The course shall include a review of mine maps, the escapeway systems, the escapes, fire-fighting and emergency evacuation plans in effect at mines, the location of abandones and dangerous areas, and an introduction to methods of barricading and the locations of barricading materials.

(6) Roof Control and Ventilation Plans - The course shall include an introduction to and instruction of the roof control plan in effect within the mining industry, and procedures for roof and rib control, and introduction to and instruction on the ventilation plans in effect within the mining industry, and the procedures for maintaining and controling ventilation.

(7) Rock Dusting - The course shall include instruction on the purpose of rock dusting and the cleanup of rock dusting programs in effect within the mining industry.

(8) First Aid - The course and instruction shall consist of a course in first aid methods.

(9) Electrical Hazards, Moving Equipment - The course shall include instruction on recognition and avoidance of electrical hazards, and the procedures for working on and near moving equipment at all locations in mines.

(10) Prevention of Accidents - The course shall include instruction on the prevention of all types of accidents including electrical and mechanical.

(11) Explosives - The course shall include review and instruction on the hazards related to explosives and the danger involved when working with and around such explosives.

(12) Health and Safety Standards - The course shall include the Health and Safety Standards contained in KRS Chapters 351 and 352 and Part 75 of the Federal Coal Mine Health and Safety Act of 1969.

(13) Gases

(14) The training program shall include all other substantive law not covered in the above courses that deals with the underground miner including review and instruction of miners' and operators' statutory rights and obligations

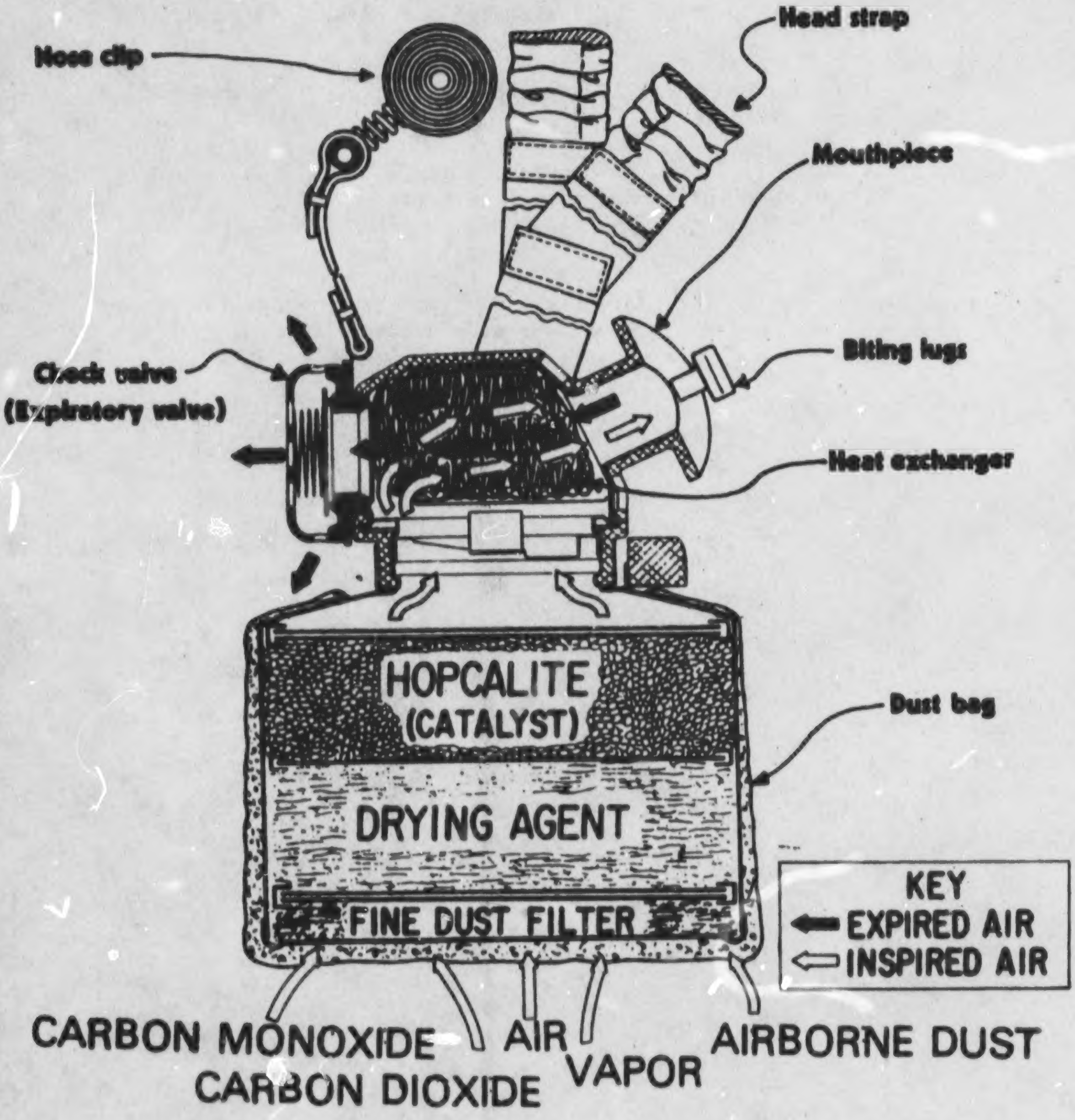
- I. Self-rescuer
  - A. Definition
    - 1. Self-rescuer is a device to be used in case of emergency for escape through an atmosphere containing carbon monoxide.
  - B. Major objective
    - 1. To instruct and train all people going underground in the proper use of the self-rescuer.
  - C. Principle aims
    - 1. To establish a working knowledge of the self-rescuer.
    - 2. To know how to operate the self-rescuing device.
    - 3. To know when the self-rescuer should be used.
    - 4. To know its capabilities and limitations.
    - 5. To know how to test the self-rescuer for airtightness.
  - D. Working knowledge
    - 1. The self-rescuer is a small gas respirator containing a catalyst (hopcalite) that changes carbon monoxide, a poisonous gas, into carbon dioxide, a relatively harmless gas. It also contains a drying agent, which prolongs the usefulness of the hopcalite, and a heat exchanger, which reduces the heat buildup produced by the chemical reaction of carbon monoxide with hopcalite
  - E. Operation of the self-rescuer
    - 1. Instructor will demonstrate the ten (10) steps, in sequence, to properly doning the self-rescuer.
  - F. Explosions and fires
    - 1. The self-rescuer should be used immediately at the first indication of a fire or explosion even though no smoke is visible. Carbon monoxide is colorless and odorless and could build up to a dangerous concentration before there is any sign of smoke.
    - 2. Signs or indications of an explosion or fire are:
      - a) A sudden interruption of power
      - b) Disturbance of ventilation current (dust-ladended air or shock waves)
      - c) Smoke or heat from the ventilation current
  - G. Capabilities and limitations
    - 1. Capabilities:
      - a) The self-rescuer device will provide the wearer protection against one (1) percent carbon monoxide for a period of one (1) hour in a respirable (16% oxygen) atmosphere.
    - 2. Limitations:
      - a) Carbon monoxide, only
      - b) Atmosphere of at least 16% oxygen
      - c) One (1) hour against one (1%) percent concentration of carbon monoxide
      - d) Cannot be reused (must be discarded)
      - e) Cannot be substituted for conventional respiratory equipment (gas masks or self-contained breathing apparatus)
      - f) Tenative storage life of five (5) years when carried on machine or by person
  - H. Inspection
    - 1. Airtightness:
      - a) Responsibility
        - 1. Before going underground every miner should examine his self-rescuer for any external damage.

- b) Methods of inspection - MSA W-65
  1. Visual inspection (crushed case or broken seal)
  2. Immersion (watch for a continual train of bubbles when covered in warm water for two to three minutes)
  3. Weight (weight gain should not be ten (10) or more grams)
- c) Methods of inspection - Drager 810
  1. Visual inspection (by unbuckling the carrying case) The unsealed respirator's two parts will separate immediately if the seal is broken.
  2. Weight (weight gain should not be ten (10) or more grams)

I. Federal and State laws

1. A one (1) hour self-rescue device approved by the Mine Safety and Health Administration shall be made available by the operator to all personnel underground.
2. Each operator shall train (initial training) and retrain all underground miners in the use, care and maintenance of the self-rescuer.
3. Where the wearing or carrying of the self-rescue device is hazardous to a person, such self-rescue device shall be located at a distance no greater than 25 feet from such person.

Self-rescuer [cutaway view]


Nose clip
Head strap
Mouthpiece
Check valve
(Expiratory valve)
Biting lugs
Heat exchanger
HOPCALITE
(CATALYST)
Dust bag
DRYING AGENT
FINE DUST FILTER
KEY
⬅ EXPIRED AIR
⇦ INSPIRED AIR
CARBON MONOXIDE
AIR
AIRBORNE DUST
CARBON DIOXIDE
VAPOR

GLOSSARY OF TERMS

Carbon dioxide. A colorless, odorless gas, harmless except in large quantities, formed as the product of complete combustion of carbon. This gas is formed as part of the respiratory process.

Carbon monoxide. A colorless, odorless, very toxic gas formed as the product of the incomplete combustion of carbon. This gas is formed during mine fires an after explosions.

Hopcalite. Catalytic granules consisting of finely divided manganese dioxide mixed with copper oxide and a small quantity of silver oxide and used in self-rescuers and gas mask canisters to remove carbon monoxide by oxidizing i to carbon dioxide.

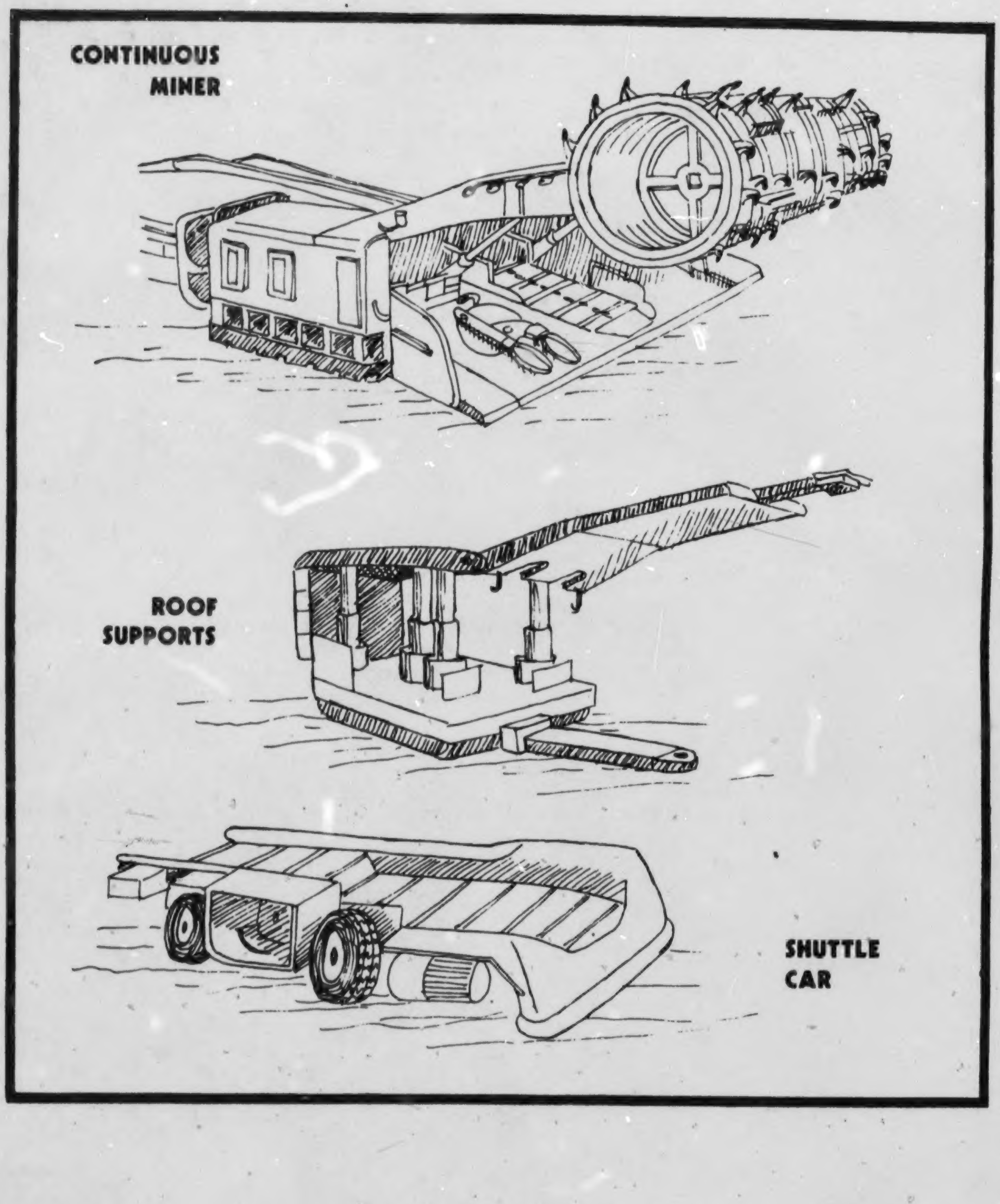
Respirator. A device for protecting the respiratory tract (as against irritating poisonous gases, fumes, smoke, and dusts) with or without equipment supplying oxygen or air.

PART II

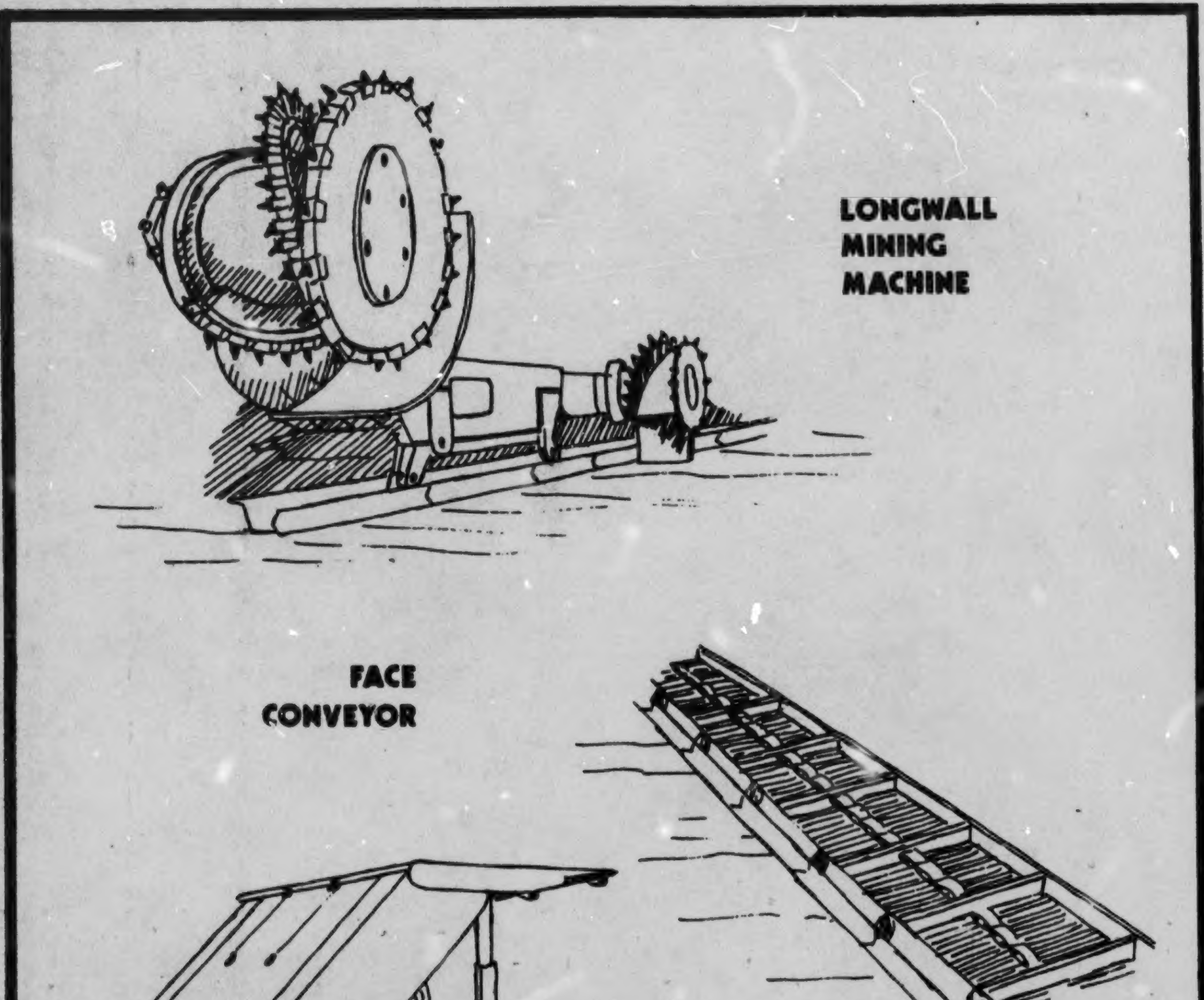
INTRODUCTION TO MINING

II. Mining methods and machines
  A. Conventional mining
    1. Conventional mining generally consists of the following steps:
      a) Undercutting the face
      b) Drilling the face
      c) Shooting the face
      d) Loading and hauling the coal, and
      e) Supporting the roof
  B. Continuous mining
    1. Continuous mining generally consists of the following steps:
      a) Continuous mining
      b) Hauling the coal, and
      c) Supporting the roof
  C. Standard coal mining machinery
    1. There are three (3) other pieces of machinery found in a mine that are used regardless of whether the mining method is conventional or continuous mining:
      a) Scoops (used to clean up spilled coal along the ribs and in the roadways)
      b) Rock dusting machines (used to apply rock dust to the roof, face and ribs)
      c) Supply cars (used to haul rock dust, roof bolts, timbers, etc.)
  D. Shortwall (or bridgewall) mining
    1. Shortwall (or bridgewall) mining is a pillar mining technique that uses a longwall type of self-advancing roof supports in conjunction with a continuous miner.
  E. Preparation plant
    1. A preparation plant is a facility, usually located on the surface, where the coal is separated from impurities, washed, and sorted into various sizes by being passed through certain screens.
  F. Notes (important things to remember)
    1. Terms
      a) Automation (automatically operated or controlled)
      b) Tram (moving of a self-propelled vehicle from one place to an other)
      c) Integral or accessory (extra equipment added to help in a secondary way)

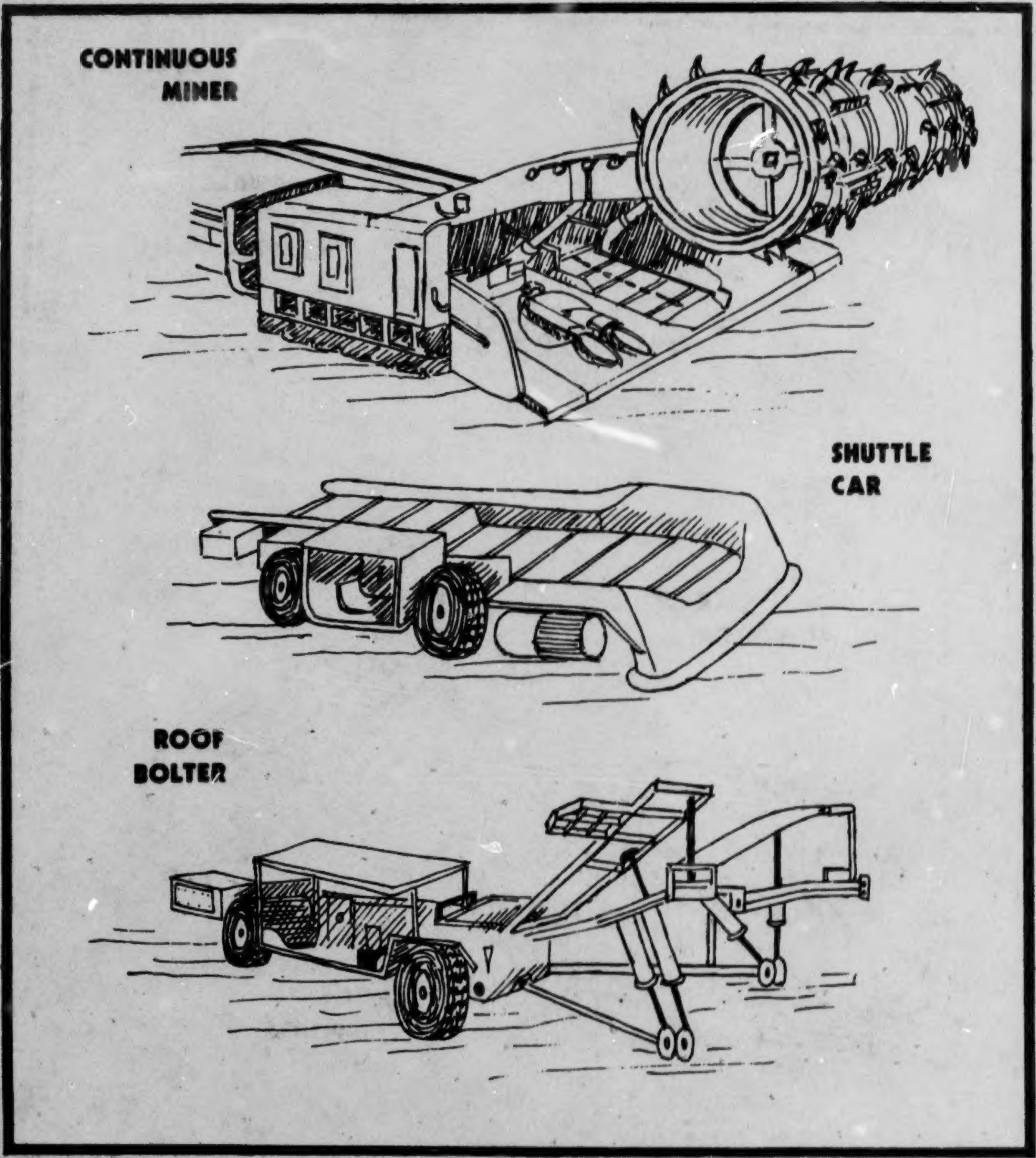
Shortwall Mining


CONTINUOUS
MINER
ROOF
SUPPORTS
SHUTTLE
CAR

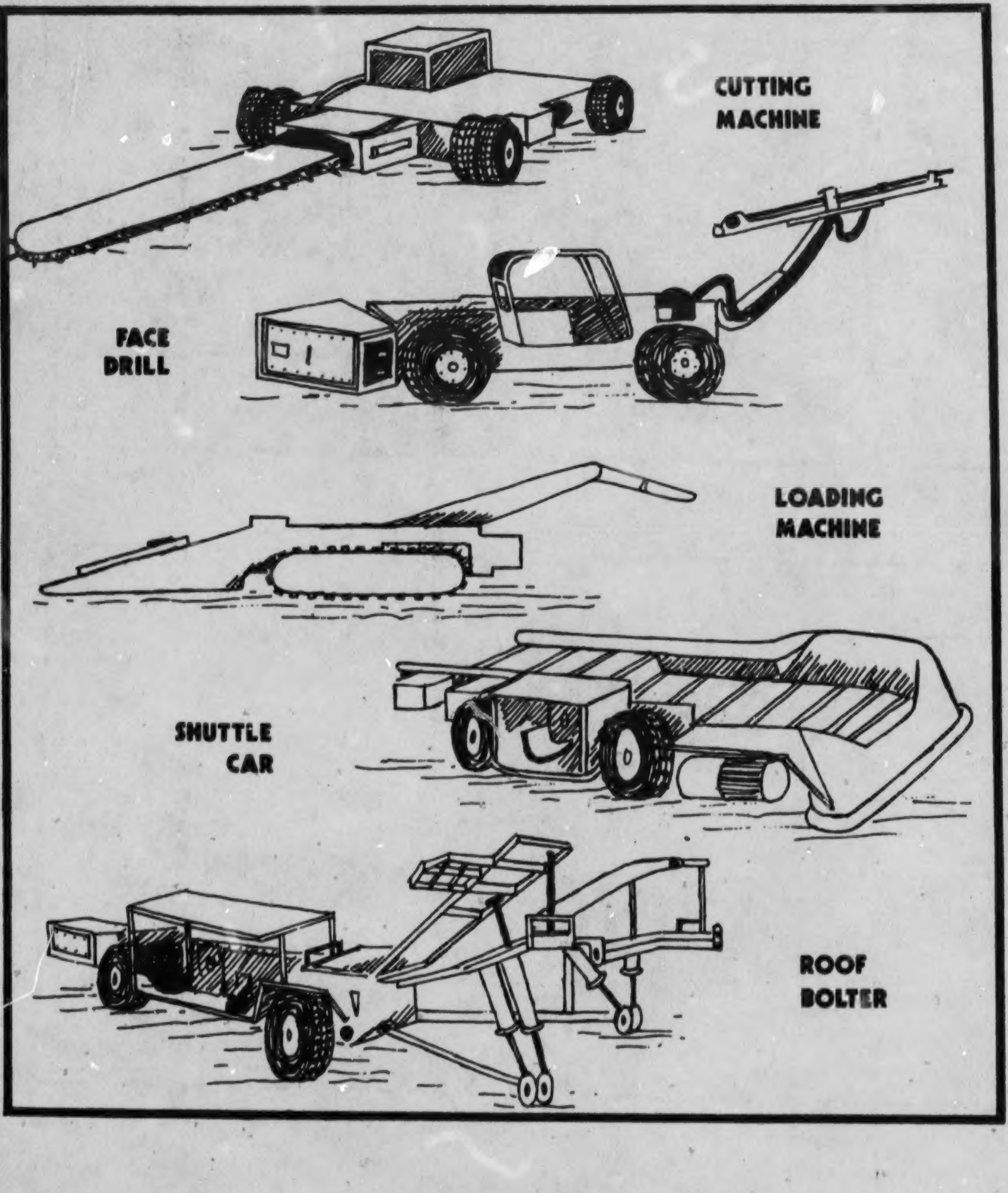
Longwall Mining


LONGWALL
MINING
MACHINE
FACE
CONVEYOR
ROOF
SUPPORTS

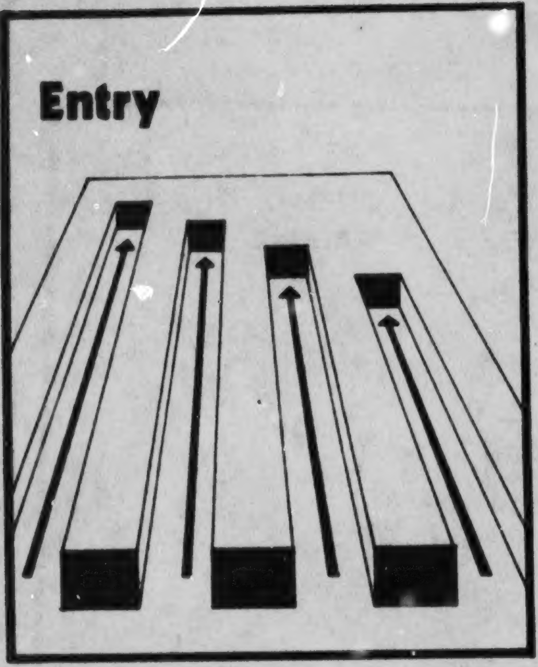
Continuous Mining

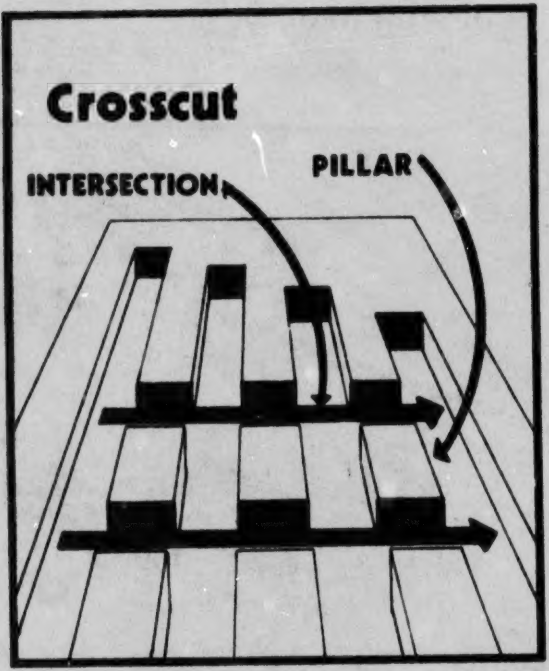

CONTINUOUS
MINER
SHUTTLE
CAR
ROOF
BOLTER

Conventional Mining

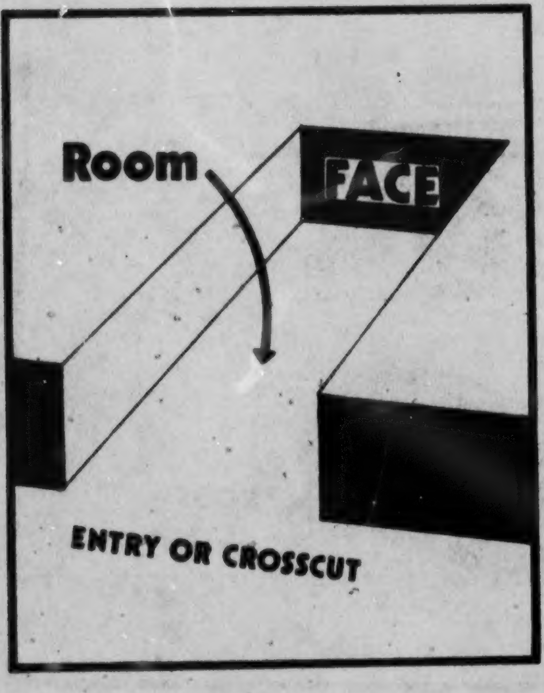

CUTTING MACHINE
FACE DRILL
LOADING MACHINE
SHUTTLE CAR
ROOF BOLTER

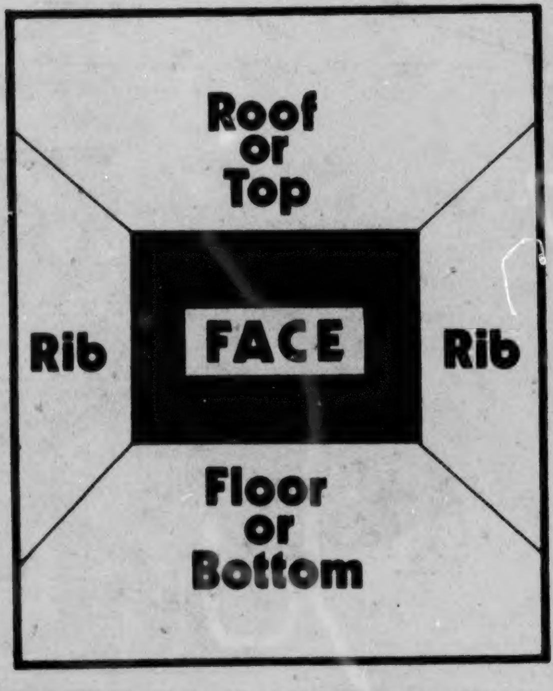
Pillaring




Crosscut
INTERSECTION
PILLAR

Note: Number the pillars according to the system used at your mine.


Room
FACE
ENTRY OR CROSSCUT


Roof or Top
Rib
FACE
Rib
Floor or Bottom

GLOSSARY OF TERMS

Anthracite. A very hard coal. It has been under more pressure underground than any other type of coal.

Bituminous. A more developed soft coal than sub-bituminous. It has been under greater pressure and is darker and harder than sub-bituminous.

Coal Bed. The area of coal underground that was once a peat bog.

Coal Seam. The layer of coal underground covered by sediment layers.

Continuous Mining. The mining method in which a continuous mining machine breaks coal from the face, gathers it, and loads it for transport.

Conventional Mining. The mining method in which coal is undercut and blasted loose to be gathered for transport by machine.

Crosscuts. Short passageways driven at right angles to an entry. They connect one entry to another. (Also called "breaks")

Drift Mine. A mine made where coal outcrops. Mining begins at the surface and goes directly into the coal seam.

Entries. The main passages driven into a coal seam as the mining operation advances.

Face. The actual area from which coal is being taken. (Also called "working face")

Floor. The bottom of an entry. (Also called "bottom")

Hand Mining. The mining method using hydraulic drilling and cutting machines to mine coal and manual loading of coal.

Hard Coal. A very hard coal (meaning it has been under great pressure underground) which burns without giving off many volatile waste products. Anthracite is the most common coal referred to as hard coal.

Headgate. The advancing roof support system and working area at the front of a longwall operation.

High Coal. A thick coal seam that allows workers to stand up in the seam and also allows for the movement of large machines.

Inby-Outby. The essential terms which are used underground to describe a location in relation to the working face. Inby - towards the working face from a point. Outby - towards the shaft or entrance from a given point.

Intersection. The area in a mine where a crosscut or break intersects or connects with another entry.

Last Crosscut. The crosscut nearest the working face.

Lignite. A young coal, brown in color, that has been under pressure underground for a shorter time than the other types of coal. It has undergone the least change from peat.

Longwall Mining. The mining method in which a large block of coal is isolated. Coal is mined from a very long face by a machine that moves along this face. Coal is hauled from the length of the face by a conveyor.

Low Coal. A thin seam of coal where movement by miners is restricted by low roofs.

Main Haulage System. The main means of transporting mined coal from the mine. The system is usually either conveyor belts, tack haulage, or a combination of both.

Mule Train. The oil and water resevoirs and hydraulic pumps needed to provide pressure to the system. It is located near the headgate entry.

Outcrop. When a coal seam appears at the surface of the earth.

Peat. Partially decayed plants that, when buried and placed under high pressure, forms coal.

Pillar. A large block of coal left by the development of entries and crosscuts. Pillars help support the mine roof.

Pillaring. The process by which pillars are removed as the mining operation retreats toward main entries. (Also called "retreat mining")

Pitch. The angle at which the coal seam inclines below the surface.

Portal. The entrance to the mine. Some mines have more than one portal.

Ribs. The sides of an entry.

Roof. The top of an entry. (Also called the "top")

Roof Bolting. Refers both to the process and plan for safely securing a freshly cut roof so that work can proceed without roof callapse. Holes are bored on pre-determined centers which correspond to the needs for safety. Steel bolts with anchors or synthetic resin are inserted and tightened. The roof bolt plan for a mine must be approved by MSHA.

Room. The area from the entry or crosscut to the face. (Also called "working place

Section. Any working area in the mine where a crew of miners is mining and loading coal.

Shaft Mine. A mine with a vertical tunnel to the coal seam.

Shortwall Mining. The mining method in which a block of coal (smaller than the block in longwall mining) is isolated and mined by a continuous mining machine.

Slope Mine. A mine with a sloping tunnel to the coal seam.

Soft Coal. Refers to bituminous and sub-bituminous coals which are considerably softer and frequently contain sulfur and ash waste products.

Sub-bituminous. A type of coal similar to lignite but somewhat darker and harder. It has been exposed to more pressure than lignite.

Sulfur. Some sulfur occurs in most coals as pyritic sulfur (fool's gold). When coal is burned the sulfur produces an unwanted by-product.

Tailgate. The trailing roof support system and working area at the back of a longwall operation.

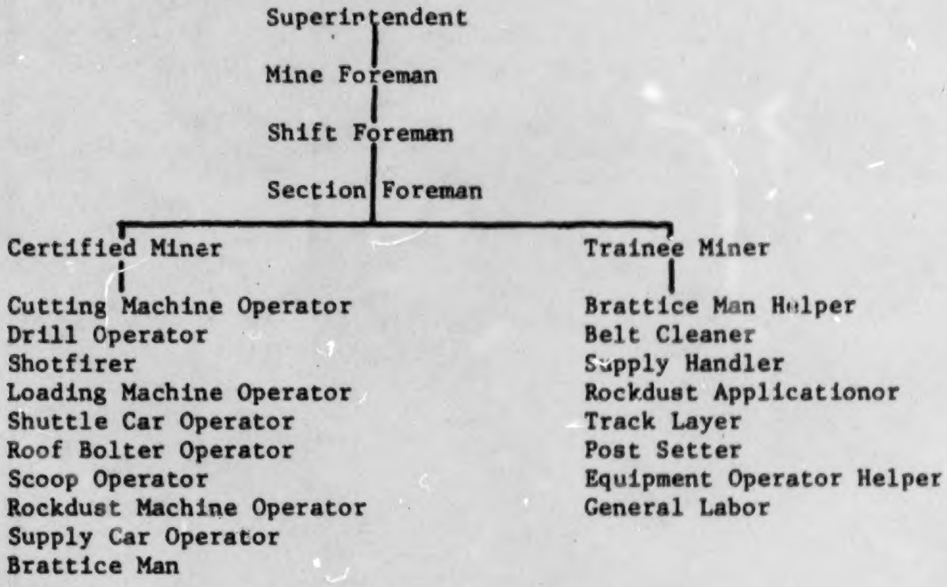
Tramming. The movement of self-propelled equipment from one location to another.

PART III

AUTHORITY AND RESPONSIBILITY OF SUPERVISORS

III. Chain of command

A. Organizational chart



Superintendent

Mine Foreman

Shift Foreman

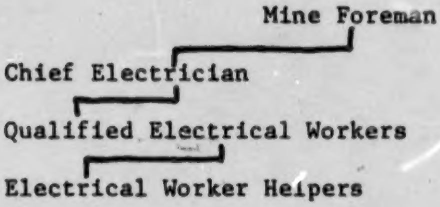
Section Foreman

Certified Miner

- Cutting Machine Operator
- Drill Operator
- Shotfirer
- Loading Machine Operator
- Shuttle Car Operator
- Roof Bolter Operator
- Scoop Operator
- Rockdust Machine Operator
- Supply Car Operator
- Brattice Man

Trainee Miner

- Brattice Man Helper
- Belt Cleaner
- Supply Handler
- Rockdust Applicationor
- Track Layer
- Post Setter
- Equipment Operator Helper
- General Labor



Mine Foreman

Chief Electrician

Qualified Electrical Workers

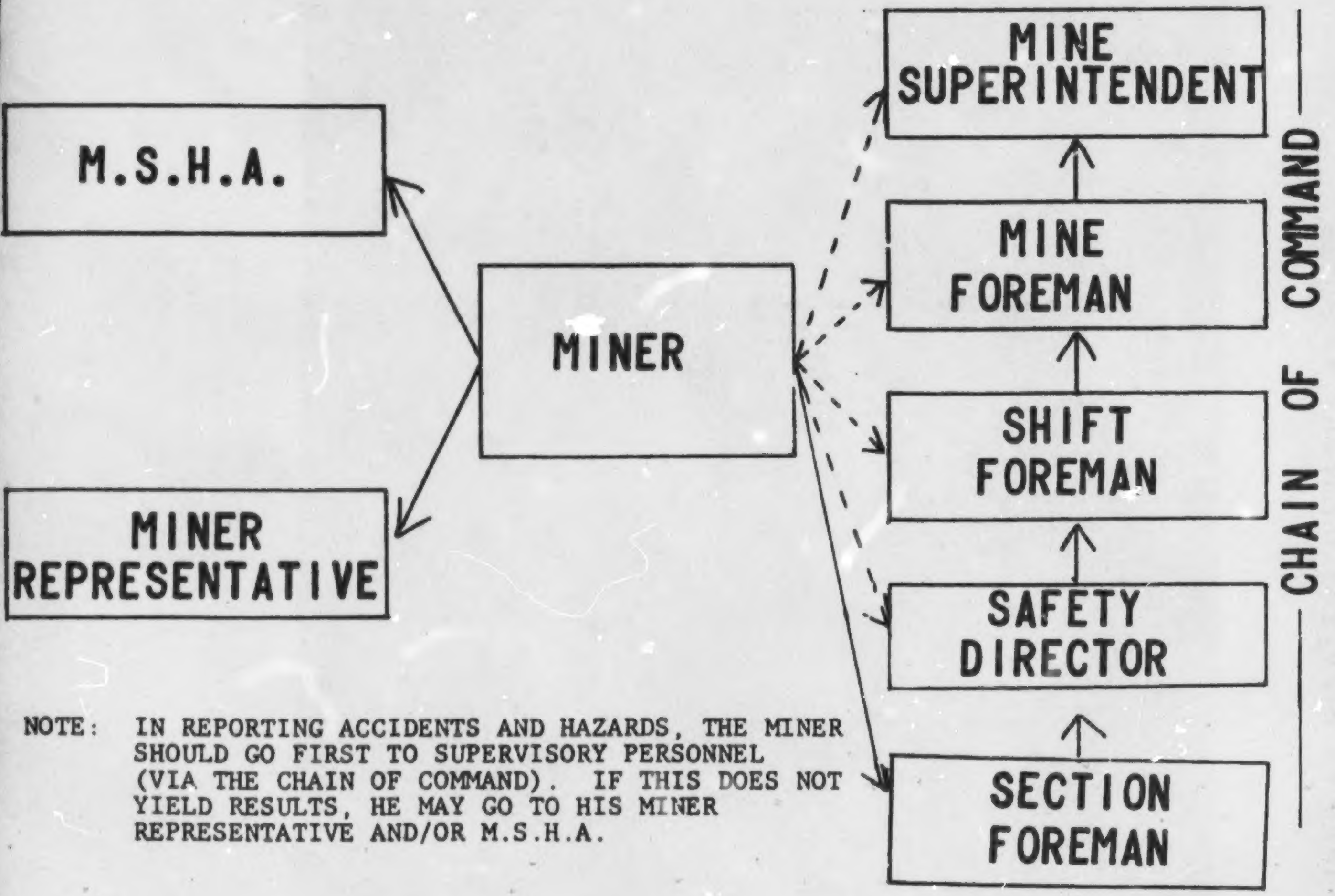
Electrical Worker Helpers

B. Supervisory Personnel

1. Tasks and duties
   - a) Superintendent
     1. Supervises the mine foreman and coordinates all activities at the mine, above and below ground.
     2. Mine superintendents directly involved in the production of coal shall hold a mine foreman certificate.
   - b) Mine foreman
     1. Responsibility for all activities underground.
     2. Supervises the activities of the chief electrician.
   - c) Shift foreman
     1. Supervises the activities of the section foreman.
   - d) Section foreman
     1. Supervises all miners working at the face.
   - c) Chief electrician
     1. Supervises the activities of all maintenance men.
   - f) Maintenance man
     1. Supervises the activities of the maintenance man helper.

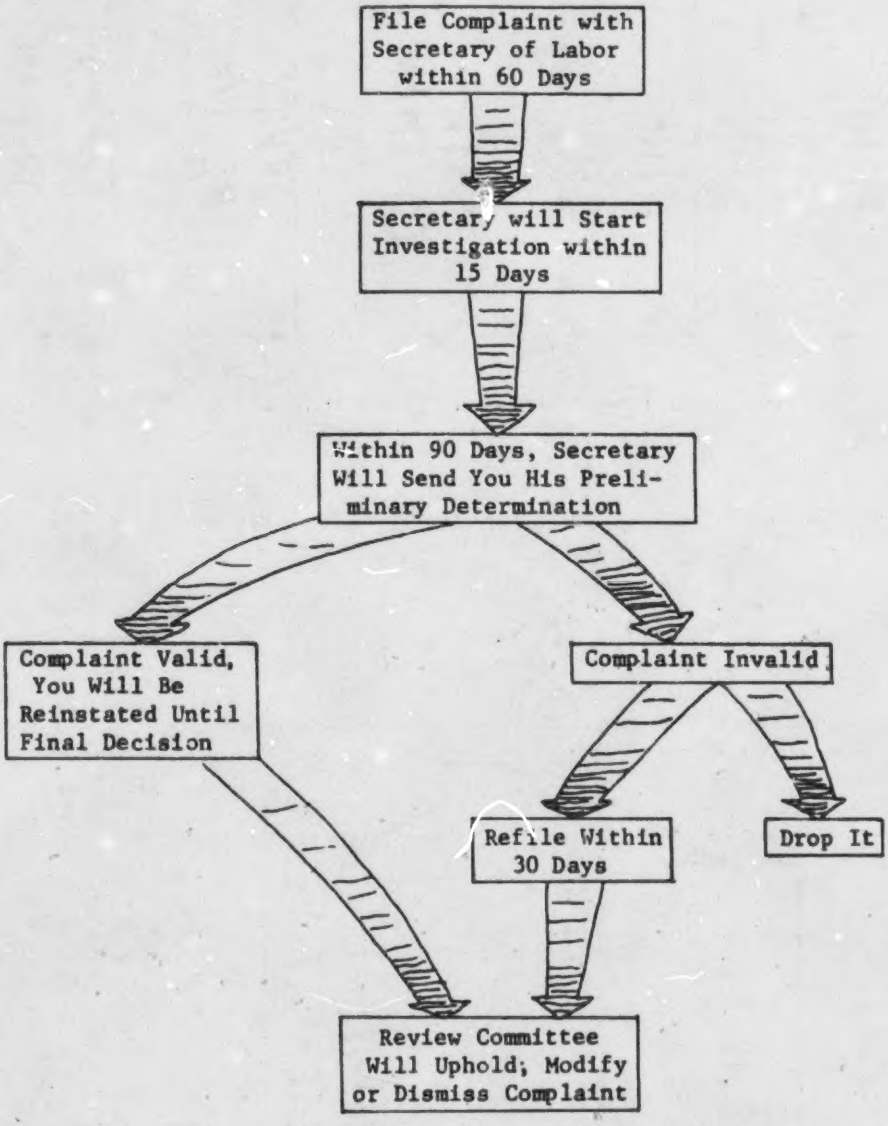
C. Trainee Miner
  1. Restrictions
    a) A new employee with less than ninety (90) working days experience in an underground coal mine shall not operate any mining machine at the face, operate any transportation equipment, mobile equipment, or medium or high voltage electricity.
    b) The state law requires that a mine foreman/fireboss has no more than five (5) trainees working with him and under his immediate supervision (within sight and sound).
    c) Also, the state law requires that a certified miner shall have no more than one (1) trainee miner working with him and under his direction (within sight and sound).
  2. Definition
    a) An underground miner is a person who enters a hostile environment, makes it safe and "digs" coal at a reasonable price.

REPORTING ACCIDENTS AND HAZARDS


MINE SUPERINTENDENT
M.S.H.A.
MINE FOREMAN
MINER
SHIFT FOREMAN
MINER REPRESENTATIVE
SAFETY DIRECTOR
SECTION FOREMAN
CHAIN OF COMMAND

NOTE: IN REPORTING ACCIDENTS AND HAZARDS, THE MINER SHOULD GO FIRST TO SUPERVISORY PERSONNEL (VIA THE CHAIN OF COMMAND). IF THIS DOES NOT YIELD RESULTS, HE MAY GO TO HIS MINER REPRESENTATIVE AND/OR M.S.H.A.

Procedure for Filing Discrimination Charges


File Complaint with Secretary of Labor within 60 Days
Secretary will Start Investigation within 15 Days
Within 90 Days, Secretary Will Send You His Preliminary Determination
Complaint Valid, You Will Be Reinstated Until Final Decision
Complaint Invalid
Refile Within 30 Days
Drop It
Review Committee Will Uphold; Modify or Dismiss Complaint

GLOSSARY OF TERMS

Allegation. To accuse someone of having done something without positive proof that he did.

Audiogram. A hearing test.

Benefits. Payments made by the government to assist miners who have suffered an injury or illness on the job and cannot work. For example, a miner disabled by black lung disease can receive black lung benefits--payment to take the place of the salary he does not receive because he cannot work.

Black Lung. Pneumoconiosis (black lung). Means a chronic dust disease of the lung arising out of employment in a coal mine.

Citation. (Summons or order). Shall be in writing and shall describe with particularity the nature of the violation, including a reference to the provision of the Act, standard, rule, regulation, or order alleged to have been violated.

Collective Bargaining. Negotiating between organized workers and their employer for reaching an agreement on wages, hours, and working conditions.

Compensation. Pay received by a miner who, although able to work, was prevented from working for reasons he could not control (such as the mine being closed, or because he was in a training class).

Miner Representative. Any person or organization which represents two or more miners at a coal mine for purpose of the Act.

Mine Safety and Health Administration (MSHA). Established in Department of Labor organization that sees that mine operators promote safe and healthful working conditions and abide by mine safety and health regulations.

Notice. Written document that a pattern of violations or mandatory health and safety standards exists in the coal or other mine which are of such nature as could have significantly and substantially contributed to the cause and effect of coal or other mine health or safety standards.

Order. Direction or command requiring the operator to cause all persons in the area affected by such violation, except those persons referred to in section 104 c of the Act to be withdrawn from, and to be prohibited from entering, such area until an authorized representative of the Secretary determines that such violation has been abated.

Section of a Mine. Portion of the working area of mine.

Toxic Material. Any material, such as a gas or chemical, that is harmful or poisonous to people and can cause illness, injury, or death.

Training Plan. A system set up by a mine operator and approved by MSHA to train miners to work underground. The training plan must meet standards set up by government and have training in health and safety procedures and practices.

PART IV

ENTERING AND LEAVING MINES
TRANSPORTATION, COMMUNICATION

IV. Mine emergency plan, check-in, check-out, mantrip and tram procedures
  A. Mine emergency plan
    1. Definition
      a) A mine emergency plan is a plan of what those in the mine will do and what those on the surface will do in case of an emergency caused by an explosion or fire.
    2. Procedures
      a) Procedures for those in the mine
        1. Recognize an emergency exists
        2. Report the location, if possible, and nature of emergency
        3. Escape from the dangerous areas; and
        4. Barricade if escapeway is blocked
  B. Check-in procedures
    1. Definition
      a) A check-in procedure is a method of keeping track of everyone who goes underground.
    2. Purpose
      a) Emergency situation
      b) General operation of the mine
    3. Identification
      a) Each person must have an identification check (tag) made of rust-resistant metal that is supplied by the company and is attached to the miner's lamp belt.
      b) According to the law, the tag must have the person's number (social security number or other number) on it.
      c) When a person is ready to go underground, his/her check-in and number and/or name must be recorded by a check-board or a time clock record.
    4. Location
      a) This record is kept on the surface in a place that is safe from destruction by fire or other hazard.
  C. Check-out procedures
    1. Definition
      a) A check-out procedure is a method of keeping track of everyone who has returned to the surface.
    2. Purpose
      a) Same as for check-in procedures
    3. Identification
      a) When a person returns from underground, his/her check-out and number and/or name is checked in the record as being out of the mine

D. Mantrip
   1. Purpose
      a) To transport underground miners from the portal (entrance) of the mine to your working section.
   2. Methods
      a) Electrically powered locomotives that run on a track and pull the open or covered mantrip cars.
      b) Self-propelled, battery operated rubber-tired mantrips that will carry 3 or 4 miners.
      c) Conveyor belts

E. Terms
   1. Tram means to move a self-propelled piece of equipment from one place to another.
   2. Danger board means a board with "DANGER" written on it and placed at the entrance to the dangerous area.

F. Boarding mantrips
   1. Rules
      a) Stay clear of tracks except when necessary to cross them.
      b) Climb in mantrips on the side opposite the trolley wire.
      c) Enter mantrips while they are stopped.
      d) Place lunch bucket and small tools in mantrip before boarding.
      e) After entering the mantrip, fasten safety chain if one is present.
   2. The law requires that a drop-bottom coal car when used to transport underground coal miners must be securely fastened to prevent it from opening.

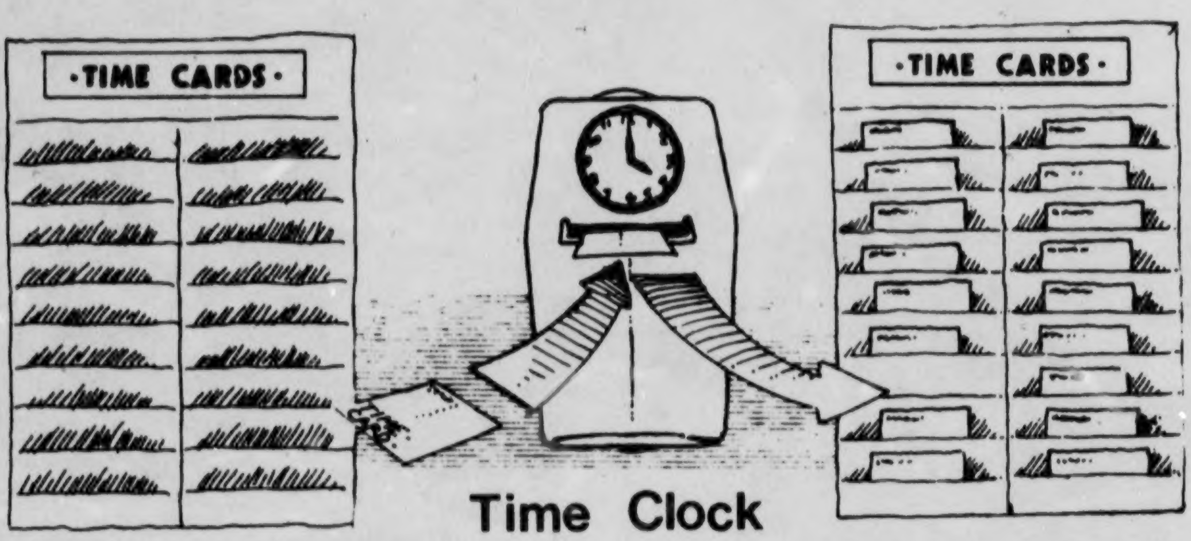
G. Riding a mantrip
   1. Rules
      a) Wear safety glasses on an open mantrip.
      b) Keep all parts of your body inside of the mantrip and watch for timbers, low cap blocks, roof bolts, and trolley wire especially when riding a mantrip without a canopy.
      c) Sit on the bottom of coal cars and ride on the side opposite from the trolley wire.

H. Unloading from mantrip
   1. Rules
      a) Wait until the mantrip has stopped to get out. Walk, don't run.
      b) Unload on the side opposite the trolley wire, if possible.
      c) Pick up your lunch bucket and small tools after getting out of the mantrip to keep hands free.
      d) Do not step on rails or between cars; to do so may result in you being run over by a locomotive or cars.

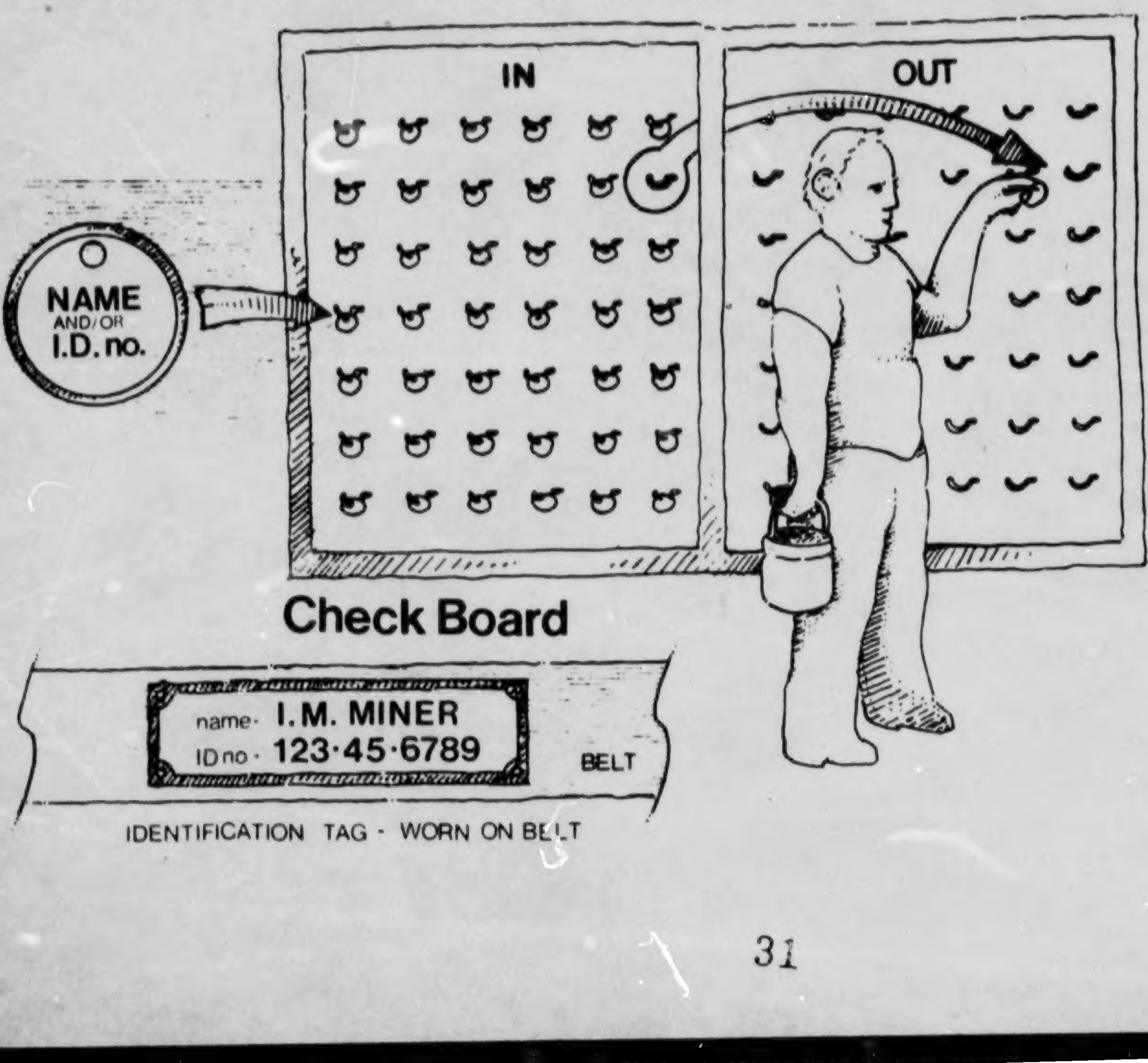
I. Crossing tracks with no cars in the way
   1. Rules
      a) Walk on the clearance side when walking along tracks.
      b) Look both ways for possible approaching trains.
      c) Watch your footing so as not to trip or fall.
      d) Cross under the trolley wire where guarded, if possible.

J. Crossing tracks with cars blocking the way
   1. Rules
      a) Cross where track is straight, not on a curve.
      b) Do not step on the rail; step directly from the ground onto a coupler between cars by lifting yourself up with your arms.

CHECK·IN, CHECK·OUT SYSTEMS


·TIME CARDS·
·TIME CARDS·

Time Clock


IN
OUT
NAME
AND/OR
I.D. no.
name· I.M. MINER
ID no· 123·45·6789
BELT

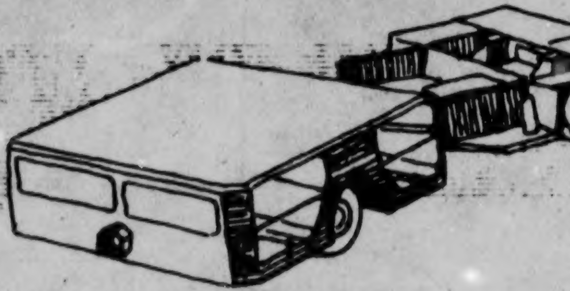
Check Board

IDENTIFICATION TAG - WORN ON BELT

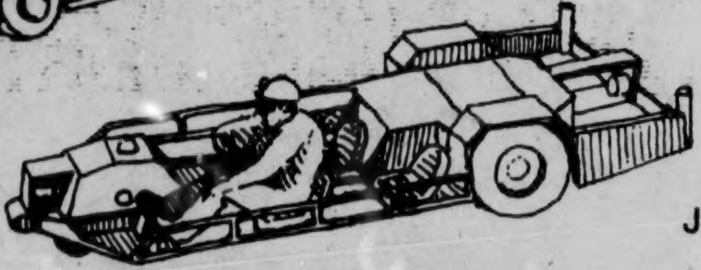
Off-Track Mantrips

PERSONNEL TRANSPORTATION

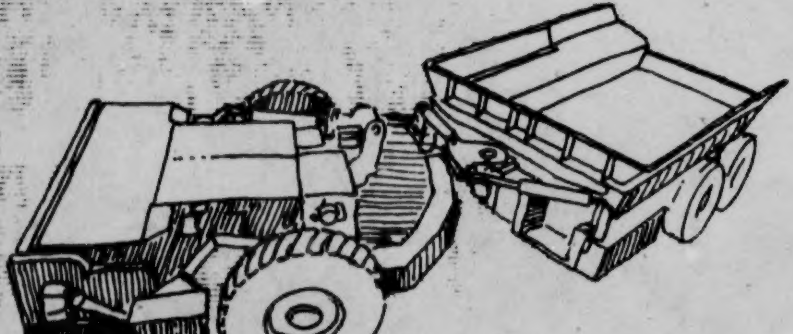
page 1



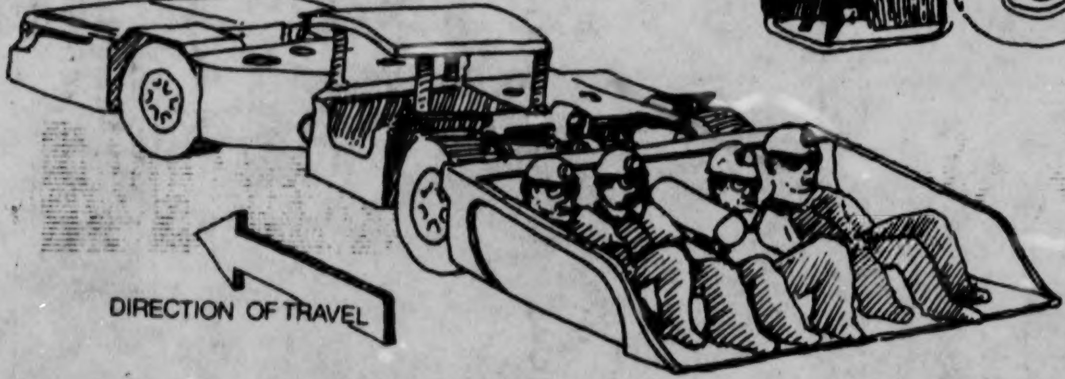
BATTERY MANTRIP



JEEP



BATTERY TRACTOR


DIRECTION OF TRAVEL

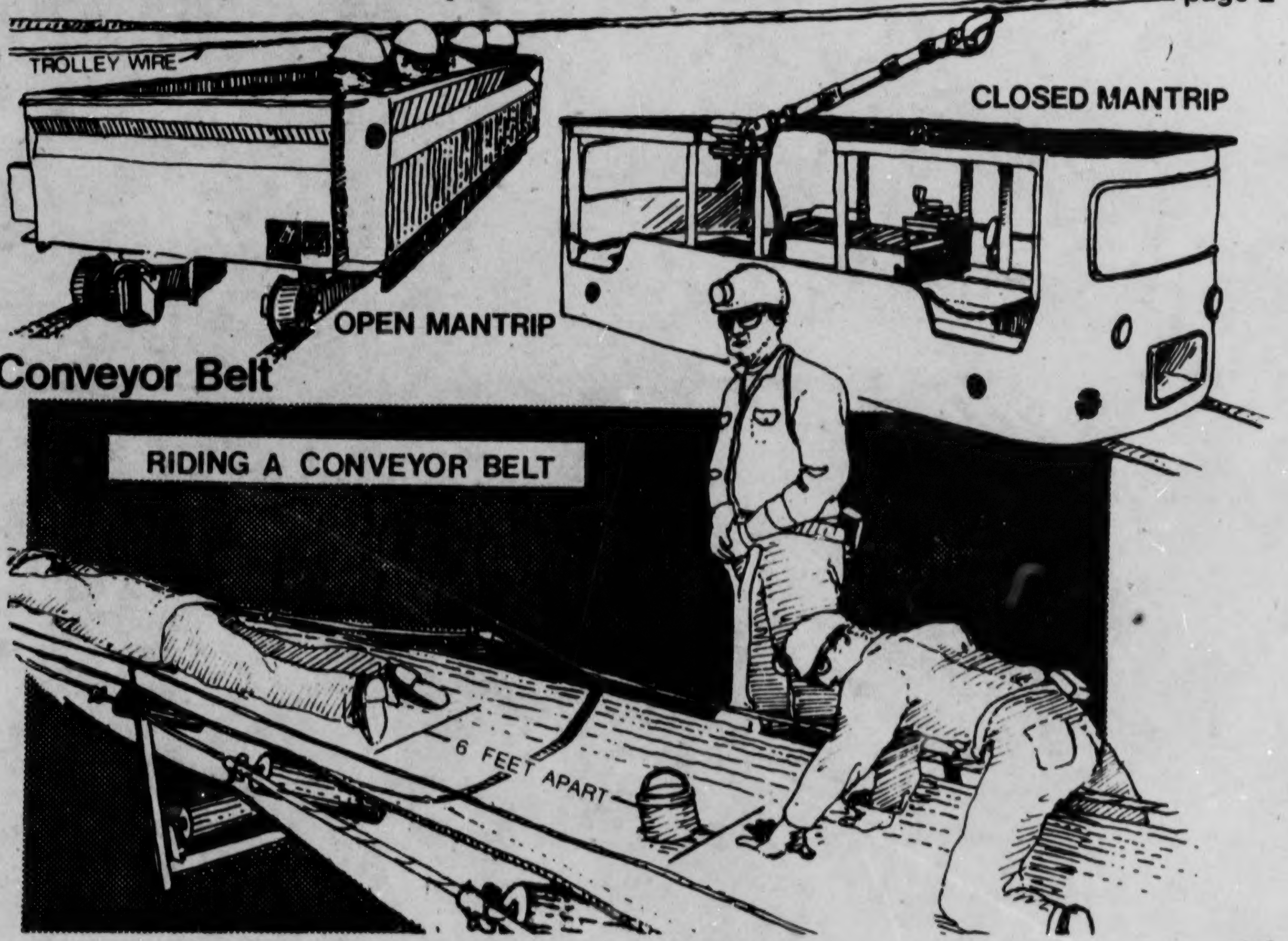
SCOOP

PERSONNEL TRANSPORTATION

page 2

Track-Mounted Mantrips

Conveyor Belt


TROLLEY WIRE
CLOSED MANTRIP
OPEN MANTRIP
RIDING A CONVEYOR BELT
6 FEET APART

K. Shelter holes
  1. Definition
    a) A shelter hole is a place of refuge built into the side of the haulageway (entry) opposite the trolley wire and are spaced about ninety (90) feet apart.
  2. Purpose
    a) To provide a place of safety from moving traffic along haulageways.
  3. Dimensions
    a) A shelter hole must not be less than five (5) feet wide, at least five (5) feet in depth and as high as the traveling space that is found along haulageways underground.

V. Riding and crossing conveyor belts

A. Purpose

1. Mantrips
2. Hauling coal
3. Hauling supplies

B. Moving parts

1. Drivers
2. Rollers
3. Idlers
4. Feeders

C. Requirements (State and Federal laws)

1. When going to and from mantrips, you will proceed in an orderly manner.
2. You should load and unload when belt is stopped.
3. There must be a clearance of eighteen (18) inches or more between the belt and roof, crossbar, cables and other objects.
4. When the clearance is eighteen (18) inches between the belt and roof, or other objects, the belt speed shall not exceed 250 f.p.m.; when clearance is twenty-four (24) inches the belt speed shall not exceed 300 f.p.m.; and when clearance is more than twenty-four (24 inches the belt speed shall not exceed 350 f.p.m.
5. Cross conveyor belts only where suitable crossing facilities are provided.
6. Miners will ride belt with no less than six (6) feet between riders.

D. Procedures

1. Riding a conveyor belt

a) Watch footing and do not hurry when you are walking to and from the belt.

b) If it is necessary to walk under the trolley wire, you should walk under a guarded area of the wire, if possible.

c) Examine belt before getting on for seams or other obstructions.

d) Place lunch bucket and small tools on first and in front of you and then keep your hands on them while riding the belt.

e) You should load facing the direction of travel, lying face down, flat on the belt and at least six (6) feet apart from other riders.

f) Keep your hands directly in front of you while riding the belt.

g) You should always wear safety glasses when riding the belt.

h) Keep materials in your back pocket and materials on your belt on your back side when riding the belt.

i) Be sure that stop controls are pointed out to you before you ride the belt.

j) Before loading or unloading from a belt, the belt must be stopped.

E. Guards

1. Purpose

a) The primary purpose of guards that enclose moving machinery is to protect the worker or repair man from possible injury. However, guards protect moving parts of machinery other objects becoming entagled in them.

2. Rules

a) Guards must always be replaced when work is completed and before belt is started again.

b) When removing the guard to work on the feeder, tailpiece, or trying to loosen a stuck idler or roller, the conveyor belt should be stopped.

CONVEYOR BELT ACCIDENTS

Causes

1. Working on the conveyor belt while it is operating.
2. Lack of guards or other protective devices.
3. Lack of crossover bridges.
4. Disregard for safety rules.
5. Carelessness or misjudgement

Causes of Fire

1. Poor maintenance.
2. Accumulation of coal and oil on or near the conveyor.
3. Missing or stuck roller.

Protective Devices

1. Mechanical equipment guards.
2. Emergency stop controls.
3. Spillage control.
4. Cascade controls.
5. Load sensing devices.

GLOSSARY OF TERMS

Crosscut. Passageway driven at right angles to the main entry to connect it with a parallel entry of air course.

Dispatcher. An employee who controls or keeps track of traffic on haulageways and informs underground workers by telephone when to move trains or locomotives.

Extensible Belt. A conveyor belt which is capable of being lengthened or shortened while in use.

Motorman. The man who operates a haulage locomotive.

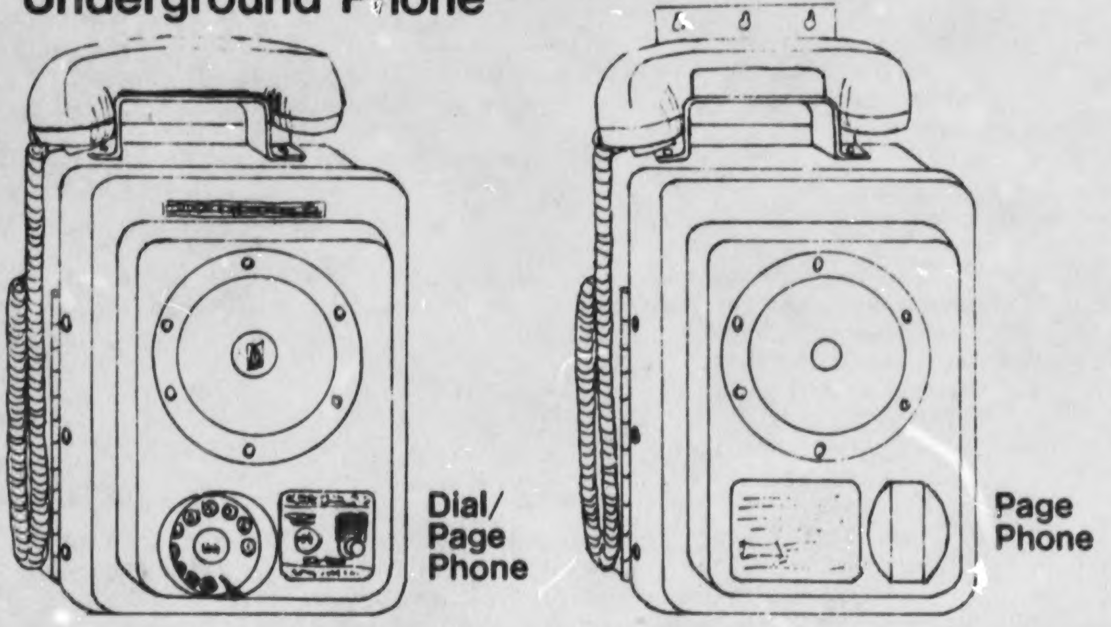
Rib. The side of a pillar or wall of an entry

Trackman. A worker engaged in putting railway tracks in place.

Panic Bar. A bar or lever which extends a sufficient distance on each side of a stop switch of self-propelled electric face equipment; accessible from all operating positions. It requires not more than 2 inches of movement and not more than 15 pounds of pressure for emergency deenergization of equipment.

VI. Communications
    A. Purpose
        1. In general, to make certain that the message from the sender is received and understood; thus, preventing accidents.
    B. Methods
        1. Oral
        2. Written
        3. Signals
    C. Concept
        1. The section foreman tells the miner what to do; the miner repeats the instructions and the section foreman agrees that is what he wants done.
    D. Cap light signals or flagging
        1. Miner's cap light
            a) Purposes
                1) Furnishes light for the miner to see.
                2) Visual communication
        2. Cap light signals
            a) Move left - sender moves head to the left of straight ahead.
            b) Move right - sender moves head to the right of straight ahead.
            c) Come here (or tram or walk) - sender describes a circle at receiver's head or on the rib.
            d) Yes (or go) - sender shakes head up and down.
            e) No (or stop) - sender shakes head right and left.
            f) Attention - sender shines cap light at receiver's head, and then, briefly, in receiver's eyes.
    E. Two-way communication system
        1. Purpose
            a) Whenever a serious accident or some other emergency such as a fire or gas explosion happens, communication is needed.
            b) Also, on track haulage equipment effective communication must be maintained between the motorman and other parts of the mine.
    F. Specific locations
        1. Each landing of main shafts and slopes.
        2. On elevators or hoists used to transport miners.
        3. On all self-propelled track haulage equipment.
        4. At each working station not more than 500 feet out by the last open crosscut and not more than 800 feet from the farthest point of penetration of working places on each section.
        5. At any working section more than 100 feet from the portal.
        6. On the surface within 500 feet of all main portals.

Underground Phone


Dial/
Page
Phone
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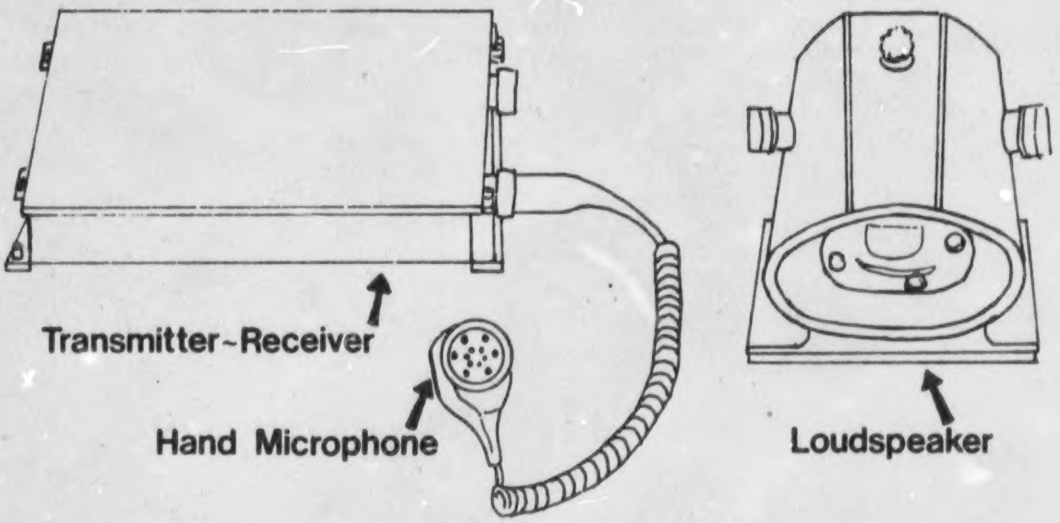
Phone

Trolley Phone


Transmitter-Receiver
Hand Microphone
Loudspeaker

Non-Verbal Communication In The Mine

SIGNS AND LABELS:	"DANGER" board "ESCAPEWAY" signs	Warning Signs
	Switches Cables Controls	Identification Labels
SIGNALS	Use of hands and/or arms Use of cap lamps Use of equipment lights	
WARNING DEVICES:	Conveyor Belt Fire Alarms Methane Monitoring Alarms	

PART V

MINE MAP, ESCAPEWAY, EMERGENCY EVACUATING AND BARRICADING

- VII. Blocked escapeway procedures
  - A. Mine emergency plan
    - 1. Procedures for those in the mine
      - a) Recognize that an emergency exists
      - b) Report the location and nature of the emergency
      - c) Escape from the dangerous area
      - d) Barricade if escapeways are blocked
    - 2. Signs and indications
      - a) Sudden changes in ventilation (air not traveling in its usual course and volume)
      - b) Blasts of air
      - c) Stench or foul smelling air
      - d) A visual or audible fire alarm
      - e) Interruption of electrical power
    - 3. Identified assembly areas
      - a) If the emergency is due to a fire or explosion, the miners should put on their self-rescuers immediately, and go to an identified assembly area, if possible.
    - 4. Escapeways
      - a) Primary escapeway
        - 1) You begin your escape by trying the primary escapeway.
      - b) Secondary escapeway
        - 1) If the primary escapeway is blocked, the secondary escapeway should be used until the emergency has been bypassed.
        - 2) The federal law requires that there be two (2) escapeways available to the miners at the working section.
        - 3) The law requires that at least one (1) of these escapeways to be on intake air.
        - 4) Also, the law requires that the height of these escapeways to be at least as high as the coal seam being mined.
        - 5) In an emergency, the most competent, experienced miner in your group should be the most likely person to help get you out of the mine.
        - 6) The lead person should also be capable of testing for gas and oxygen deficient air, and should continually monitor the condition of the air on the way out.
        - 7) Escapeways should be clearly marked or coded so that you will know which is which and the way out.
    - 5. Barricade
      - a) When you are sure escape is cut off you should consider barricading yourselves away from the deadly gases.
      - b) Barricading is a last resort measure.
      - c) You should know when to build barricades, where to build them, how to build them, and what you should do after the barricades are built.
      - d) When a fire or explosion occurs somebody must take charge.
      - e) First aid treatment should be given to those who are seriously injured.
      - f) Erect as few barricades as possible.
      - g) If possible, include in the barricade such things as, a bore hole to the surface, a telephone, water lines or air lines and if available, oxygen tanks.
      - h) Barricades may be erected from almost anything in the mine.
      - i) Barricades must be air-tight.

j) A sign of some kind should be left in front of the outside stopping to indicate that men are behind it.
k) After the barricade has been completed it should be tested for leaks by using the flame safety lamp.
l) Keep only one or two electric cap lamps lighted.
m) Miners should sit or lie down and remain as quiet as possible to conserve oxygen in the air.
n) Generally, signaling to the outside can be heard farther by pounding on solid roof rock or coal than pounding on pipelines or track rails.
o) When you hear three (3) shots, the locator equipment has arrived and is listening for your signal.
p) When you hear three (3) shots use the heaviest thing you can find and pound as hard as you can ten (10) times on a solid surface. Then rest for fifteen (15) minutes and pound again ten (10) times.
q) When you hear five (5) shots on the surface your location has been pin pointed and help is on the way.
r) Wait for the rescue team to open the barricade.

6. Notes (Important things to remember)
   a) Usually, mine maps will show both the isolated and the unisolated escapeways.
   b) Isolated intake escapeways means that the escapeway is separated from belt and track haulageways as well as from return airways.
   c) The law now requires that one (1) escapeway be on intake air unless the mine has a special permit.
   d) The most probable sources of fires are belts, electrical installations, and mining machinery.
   e) The most probable location for a fire or explosion to take place is at the face area of a working section.
   f) The federal law now requires that an escape and fire plan be adopted at each mine, escapeways established, and maintained, escapeway maps posted, and escape drills held every ninety (90) days.
   g) Barricading means building air-tight stoppings to enclose a large quantity of fresh air and to keep any poison gases out while you await rescue.
   h) A pair of miners should be sent to check the condition of the escapeways.
   i) A man at rest will use up the oxygen in one (1) cubic yard of air in one (1) hour to survive.
   j) Depending on the materials used, it will take from 30 minutes to 2 hours to build a good air-tight barricade.
   k) Make sure there are no manways, cross cuts, or other open connections with other workings through which gas can enter.
   l) If you are unable to communicate leave evidence by written notes, chalk marks on boards and rails, or markings in the dirt as to where your barricaded area is located.
   m) No one should be forced to take part in the barricading who does not want to do so.

PART VI

ROOF CONTROL
AND
VENTILATION PLANS

VIII. Roof and rib control

A. Two (2) types of roof
  1. Immediate roof
    a) The immediate roof is the bed of rock directly above the coal seam.
    b) The immediate roof is often made up of thin layers of shale, which, are weak and do not take much stress or pressure from above.
    c) This is the type of roof that needs the most support and causes the most accidents.
    d) When the immediate roof is allowed to sag from the pressure of its own weight as well as from the weight of the overburden, the sagging may cause spaces to form between the rock strata above the coal seam that can fill with methane gas and water.
    e) All of the strata above the coal are called the overburden.
  2. Main roof
    a) The main roof is the bed or beds of rock above the immediate roof.
    b) The most common types of main roof are mixtures of sandstone, limestone, and clay (shale), or large limestone or sandstone deposits.
    c) The main roof is very heavy and can only be supported by the pillars of coal or permanent supports.

B. Roof Support
  1. Permanent support
    a) Roof bolts
      1. Beam building (bolts are use to bind the immediate roof strata together).
      2. Suspension (bolts tie the lower stratum of the roof to a stronger stratum located above).
      3. Resin (resin spreads through the strata surrounding the bolt and seals the crevices or cracks). This type of roof bolt does not anchor itself into the solid rock above.
    b) Conventional
      1. Conventional support is one that uses material (metal or wood) to support the roof.
    c) Combination
      1. Combination support is a roof support that employs both roof bolt support and conventional support.
  2. Temporary support
    a) Temporary supports are any type of roof support that are intended to be in place only a short time and are designed to be easy installed and removed.
    b) Temporary supports are replaced by permanent supports.
    c) Temporary supports should be installed if you cannot stay under permanent supports.
    d) At least two (2) temporary supports should be installed not more than five (5) feet apart in a working face area.
    e) When additional work such as rebolting or installing crossbars is needed, at least two (2) rows of temporary support no more than five (5) feet apart should be installed across the place.

- f) Temporary support should be installed within five (5) feet of the face or rib and no more than five (5) feet apart.

C. Roof Control Plan
  1. Definition
    a) A roof control plan specifies how many supports, what kind of supports and where supports should be installed.
  2. Roof control plans must be approved by state and federal agencies.
  3. Also, the roof control plan specifies the pattern of placement of the supports.
  4. Remember, roof control plans were established for a standard set of conditions and that additional supports are to be installed where necessary.
  5. Definition
    a) "Adequate" support means taking precautions under all conditions and providing additional support where necessary.

D. Inspection of roof and ribs
  1. Visual inspection
    a) Observance of such potential dangers as, cracks, slips, rolls, horsebacks, and kettlebottoms.
    b) Also, such other dangerous conditions as brows, "working" or "slushing" of roof and ribs, props or crossbars bending.

E. Sound and vibration examination
  1. Procedure
    a) Sounding tool (metal rod or hammer)
    b) Before sounding roof and ribs, put on your safety glasses.
    c) Always see that you have a safe line of retreat.
    d) While looking toward the face tap the roof lightly before increasing the stroke, and keeping the other hand with the bare fingers to the roof and the thumb pointed toward you.
    e) Solid roof and ribs give a musical sound that is clear, while bad top and ribs give a hollow, drummy sound or a "thud" sound.

F. Reporting unsafe conditions of roof and ribs.
  1. Procedure
    a) If unsafe roof conditions cannot be corrected safely, you should leave the area immediately, put a danger board at the entrance, and report the situation to your supervisor and to the other workers.

G. Responsibility
  1. When you become an underground coal miner you will be responsible for:
    a) Making proper inspection and examination of roof and ribs.
    b) Reporting unsafe roof and rib conditions to your boss.
    c) Removing loose, dangerous materials.
    d) Setting extra roof support, if needed.

H. Slate bar
  1. Use of slate bar
    a) Get other miners out of the way.
    b) Stay under supported roof.
    c) Get a balanced position.
    d) Remove the small pieces first.
    e) Pry up on the bar.

I. Frequency of inspection
   1. The visual inspection is made almost constantly while you are underground.
   2. The sound and vibration method is used after a visual inspection, and should be done before any work or machine is started and as frequently after that as is necessary to insure safety.

J. Roof falls
   1. Causes
      a) Careless actions
      b) Failure to observe roof conditions
      c) Failure to follow the roof control plan
   2. Specific locations
      a) Most accidents and fatalities resulting from roof falls occur within twenty-five (25) feet of the working face.
   3. Prevention
      a) Inspect and test working area often
      b) Trim loose materials
      c) Work from a safe position
      d) Always keep a safe line of retreat
      e) Follow roof control plans
      f) Don't go beyond supports
      g) Don't assume everything is safe
      h) Stay alert!

K. Notes (important things to remember)
   1. The term "overburden" means all of the strata above the coal seam.
   2. The term "cap coal" means a thin layer of coal that is sometimes left on top of the immediate roof to insulate the shale or slate from exposure to air.
   3. Roof and rib conditions often change because of the weather.
   4. The term "bearing plate" means that the roof bolt assembly is equipped with a steel plate which rides against the mine roof to provide a weight bearing surface.
   5. The term "headers" means a wooden block that is sometimes placed between the roof bolt bearing plate to provide additional support and to prevent the plate from digging into the softer material of the roof.
   6. The term "cap block" means a flat piece of wood (usually 2' X 4" X 1") installed over a straight post to provide more bearing surface for the support.
   7. The term "crossbar" means a form of wood or steel support that extends across the roof horizontally and is normally placed on top of two (2) props that are located on each side of the entry.
   8. Temporary supports are also called safety jacks.
   9. Permanent supports must be installed prior to removing temporary supports.
   10. The term "chock" means a large hydraulic jack that is often used in conjunction with longwall mining to provide a large area of support for the mine roof.
   11. The term "crib" is a type of roof support designed from placing round or square timbers one on top of the other to provide added support for pillars or areas that are very wide.

12. A green prop or timber is not nearly as strong as an air dried or kiln dried piece of timber.
13. The cap block must be larger than the top of the post.
14. The term "wedge" means a piece of hardwood that has one edge tapered so that it can be driven between the cap block and post to tighten them.
15. A cap block should be of softer wood than either the post or the wedge.
16. Cap blocks help distribute the load and prevent the timber from cracking or damaging the roof material.
17. More miners are fatally injured by the falls of the roof and rib than any other single cause.
18. Never go beyond the last roof support when testing roof and rib.
19. You should never use a shovel or wrench for a testing tool.
20. Pointing your thumb toward you when testing roof makes it difficult for you to get directly under the area you are testing and help to keep you from walking under unsupported roof.
21. You should test the ribs and the face as well as the roof.
22. Accident reports disclose that more injuries from falls of roof have occurred where roof conditions appeared to be good.
23. Remember, roof control plans are minimums and additional supports should be installed where necessary.

VISUAL INSPECTIONS

INSPECT THE ROOF AND RIBS FOR:

(1) STRESS CRACKS IN ROOF, FLOOR, AND RIB;

(2) KETTLEBOTTOMS, CLAY VEINS; OR ANY ABNORMAL ROCK FORMATION;

(3) A FORMERLY DRY PLACE THAT BECOMES WET;

(4) SMALL CHIPS OR BARK AROUND TIMBERS.

(5) MOISTURE OR CRACKS THAT MAY APPEAR IN THE ROOF LONG AFTER THE AREA HAS BEEN SUPPORTED;

INSPECT SUPPORTS FOR:

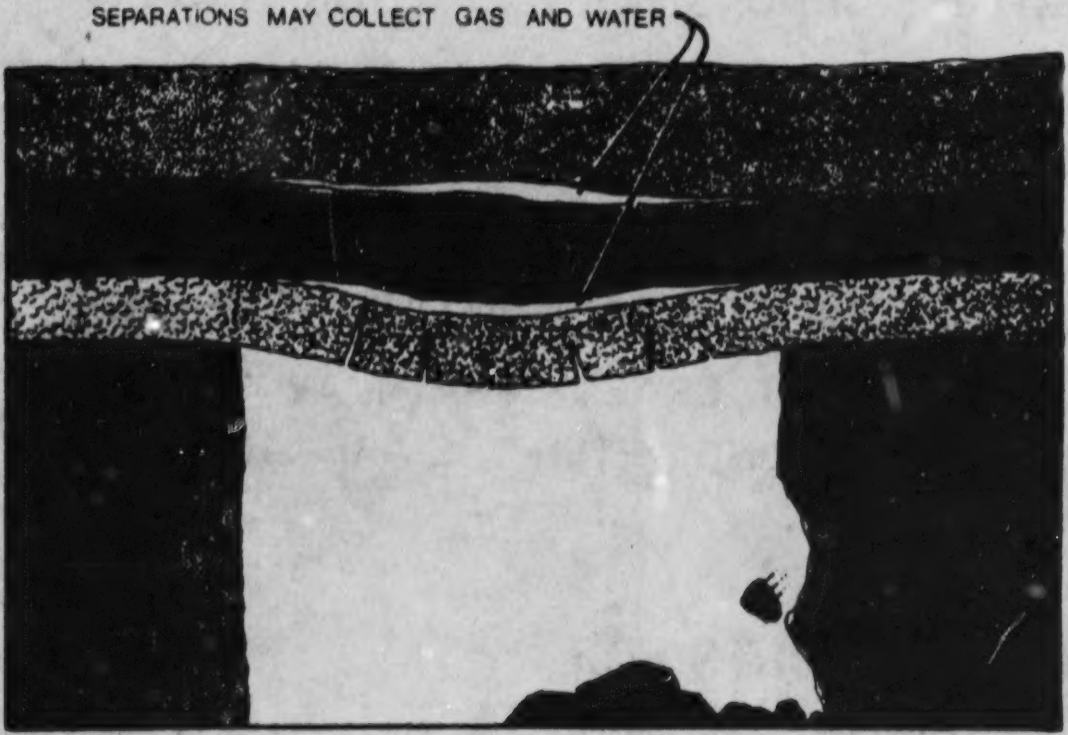
(1) CROSSBARS, TIMBERS, AND POSTS THAT ARE BENT OR HEAVY PRESSURE;

(2) ROOF BOLTS THAT SHOW SIGNS OF STRESS;

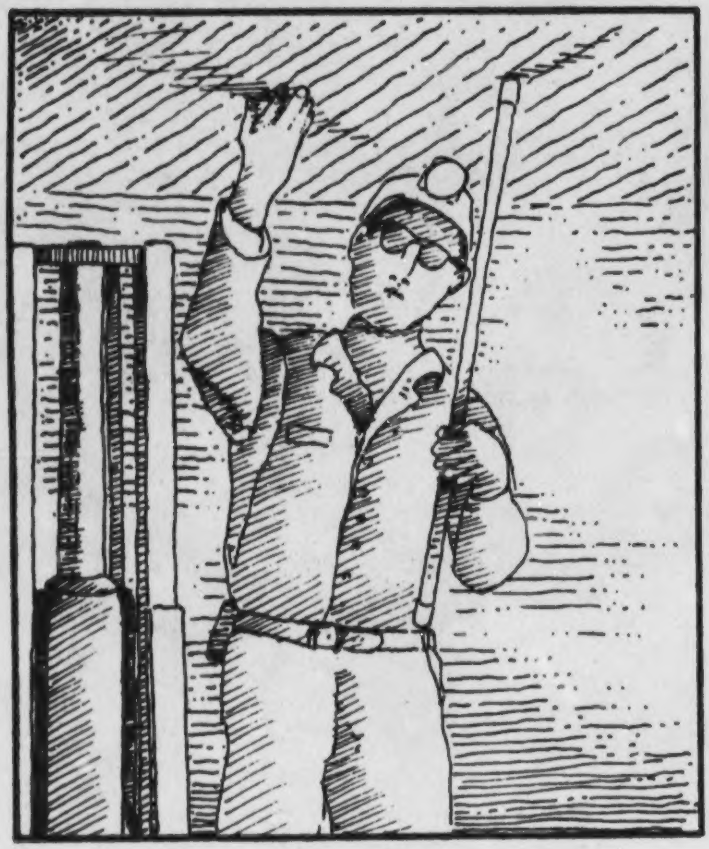
(3) CAP PIECES SQUEEZED DOWN AND OVER POSTS;

(4) TIMBERS DECAYED THROUGH TIME.

SEPARATIONS AND RIB FALLS


SEPARATIONS MAY COLLECT GAS AND WATER

ROOF TESTING



TESTING THE ROOF AND RIBS

1. PROTECT YOUR EYES WITH SAFETY GLASSES OR GOGGLES WHILE TESTING.

2. MAKE YOUR EXAMINATIONS UNDER SUPPORTED TOP AFTER YOU HAVE MADE A GOOD VISUAL INSPECTION.

3. NEVER TURN YOUR BACK TO THE FACE OR RIBS WHILE TESTING.

4. TAKE YOUR TIME AND EXAMINE THE ROOF THOROUGHLY.

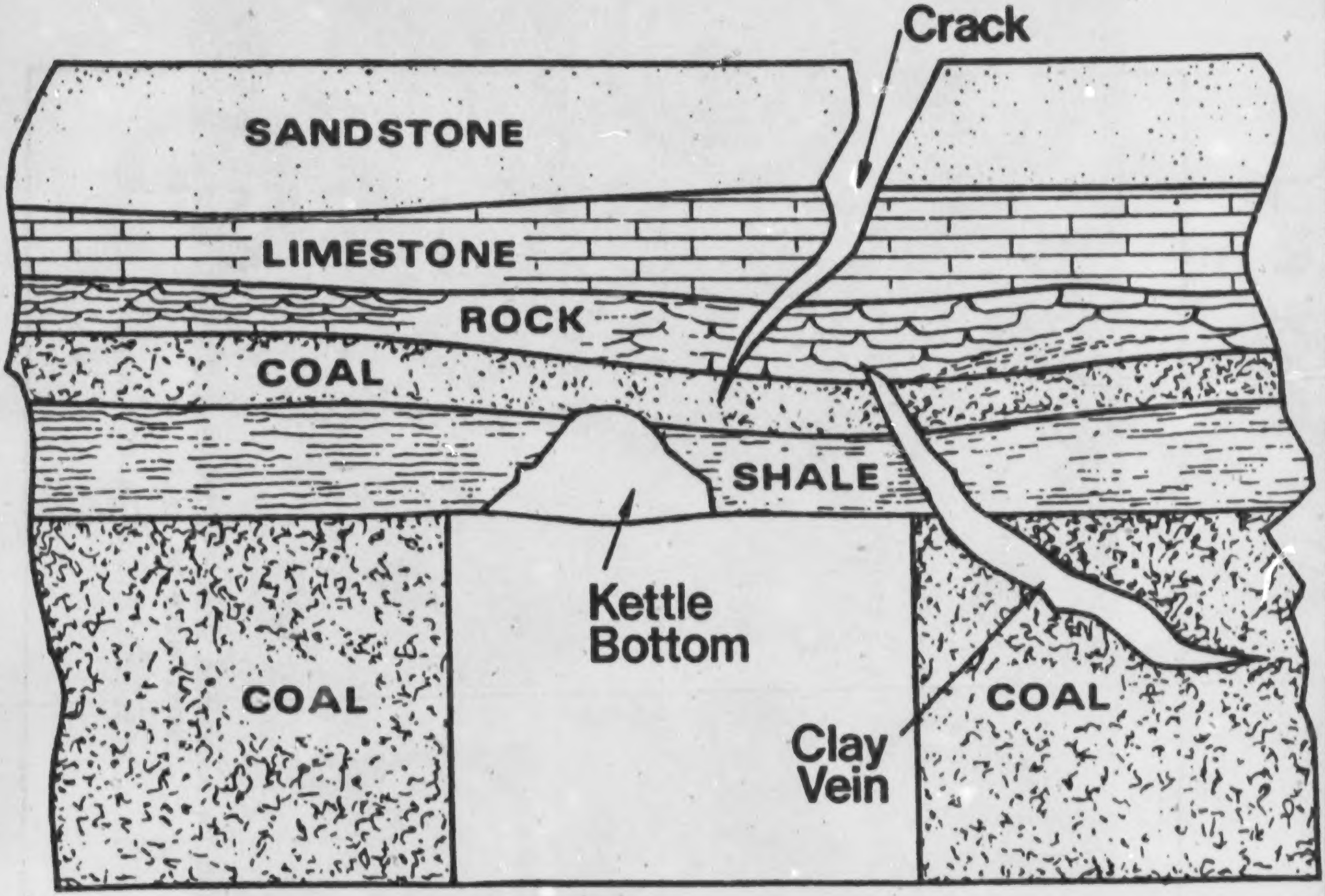
5. EXAMINE THE ROOF FREQUENTLY WHILE WORKING.

6. TURN THE MACHINERY OFF DURING TESTING.

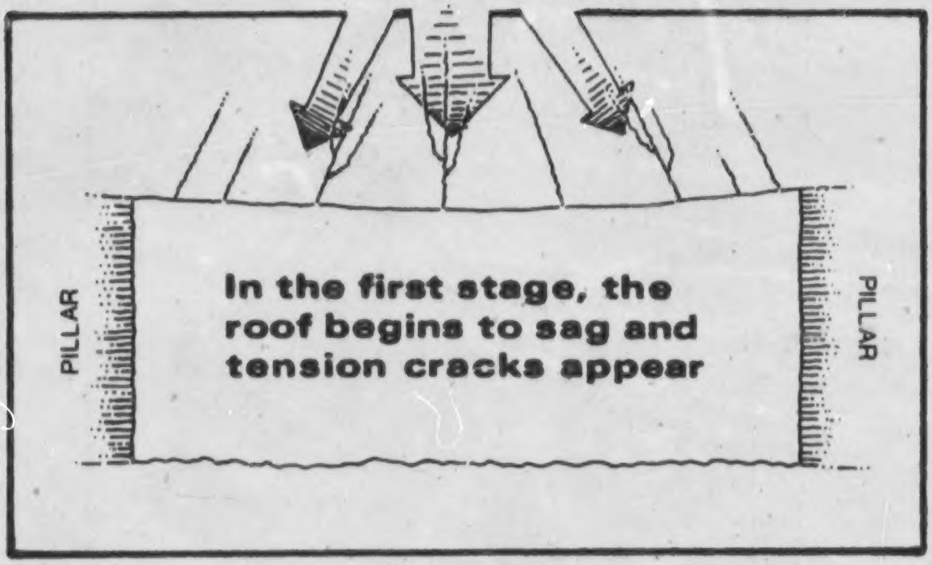
7. USE STURDY BENCH OR LONG TESTING TOOL FOR HIGH PLACES.

8. NEVER ASSUME SOMEONE ELSE HAS MADE THE TESTS.

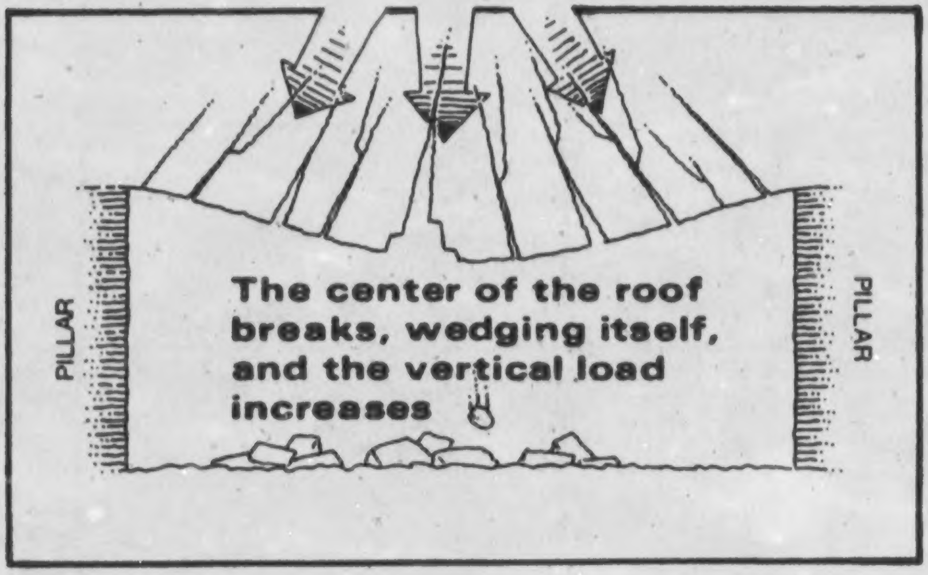
MINE STRATA WITH FAULTS AND INTRUSIONS


Crack
SANDSTONE
LIMESTONE
ROCK
COAL
SHALE
Kettle Bottom
COAL
COAL
Clay Vein

ROOF FALL

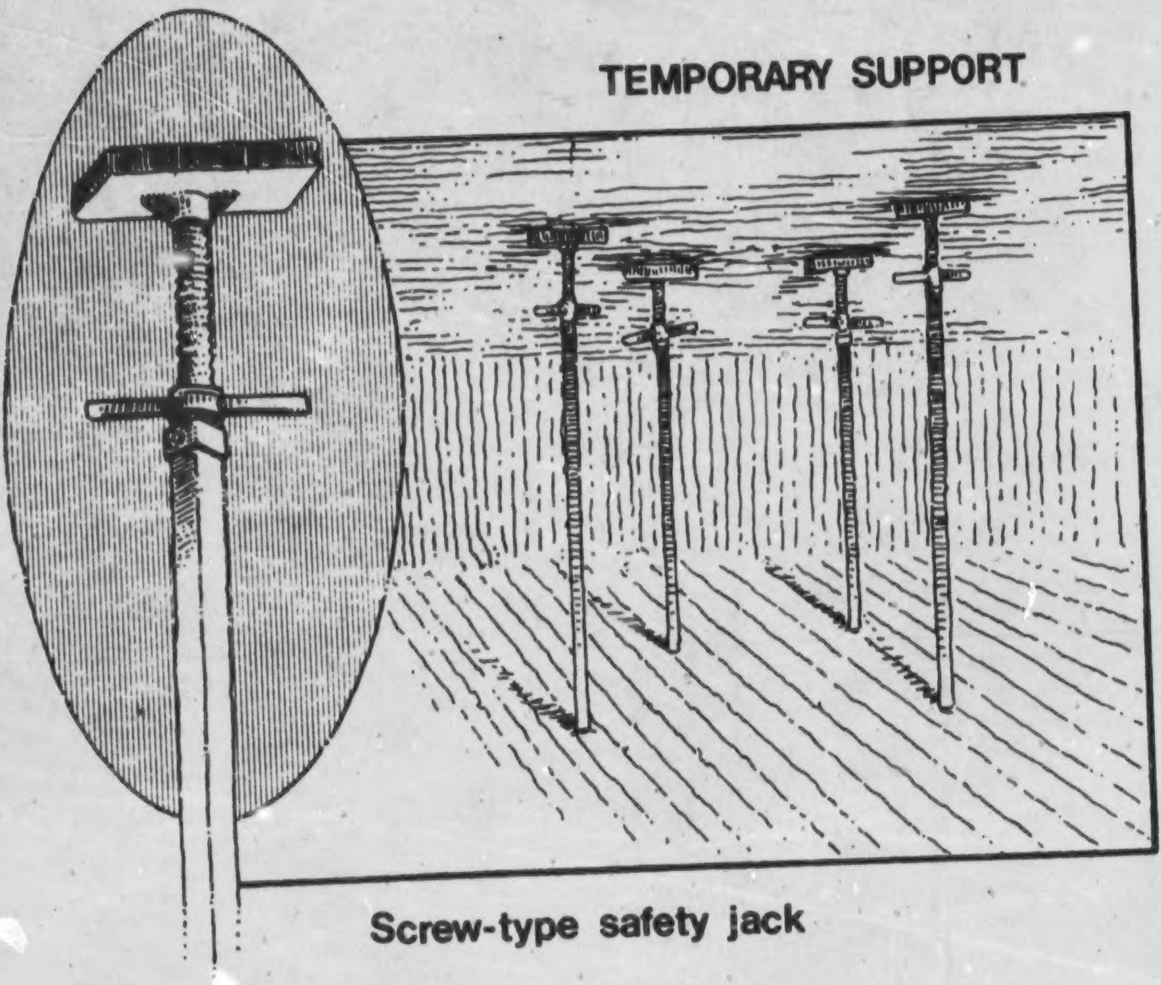

PILLAR
PILLAR

In the first stage, the roof begins to sag and tension cracks appear


PILLAR
PILLAR

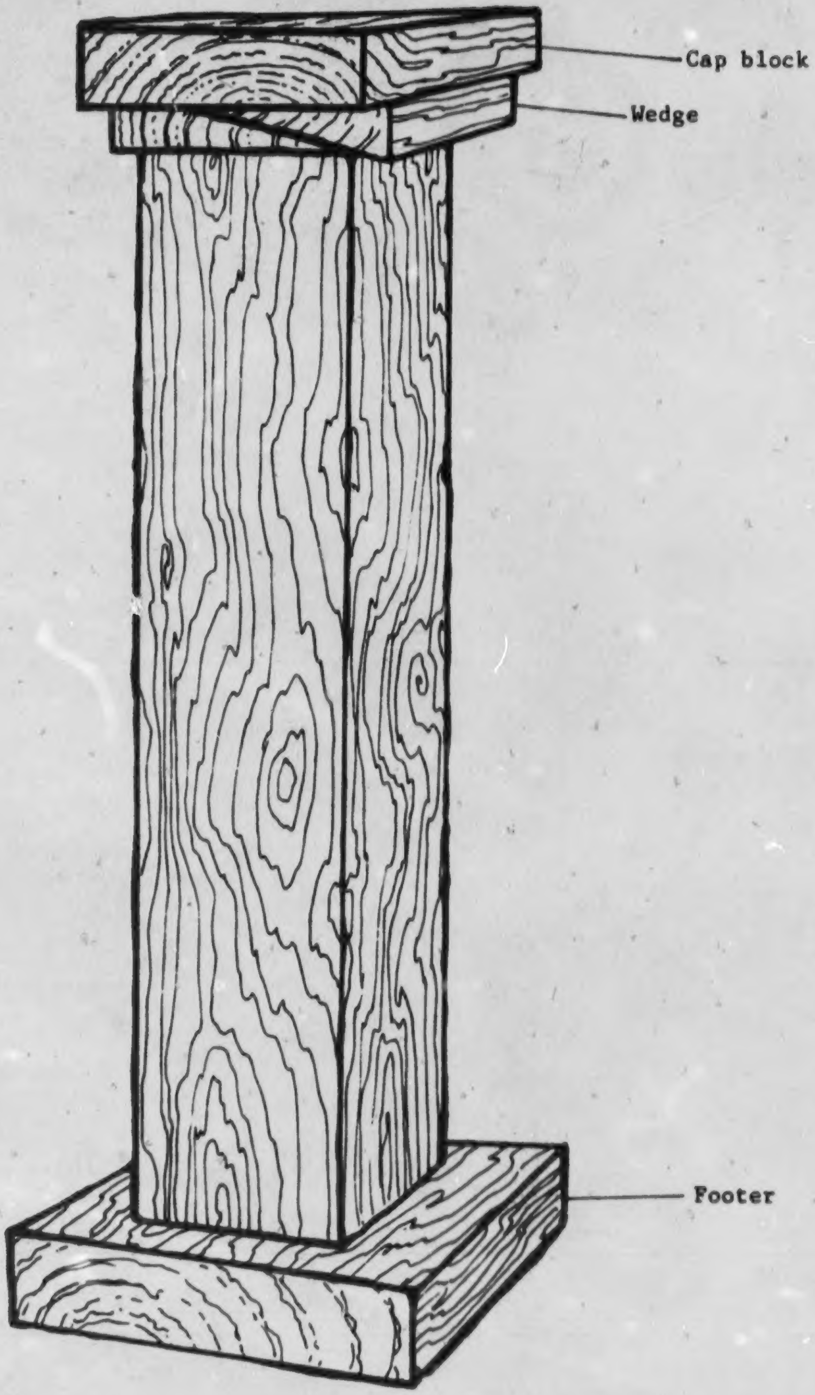
The center of the roof breaks, wedging itself, and the vertical load increases

TEMPORARY SUPPORT

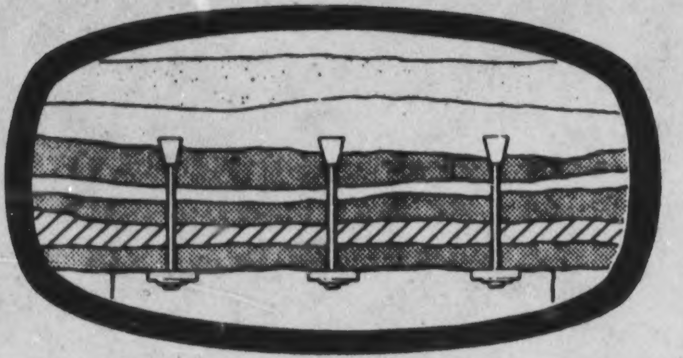


Screw-type safety jack

POST INSTALLATION

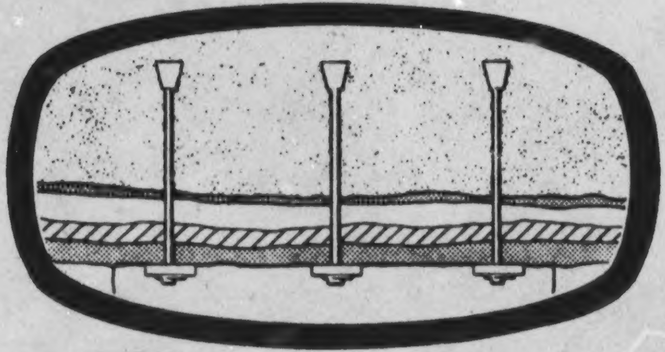

Cap block
Wedge
Footer

TWO METHODS OF ROOF BOLTING



BEAM METHOD

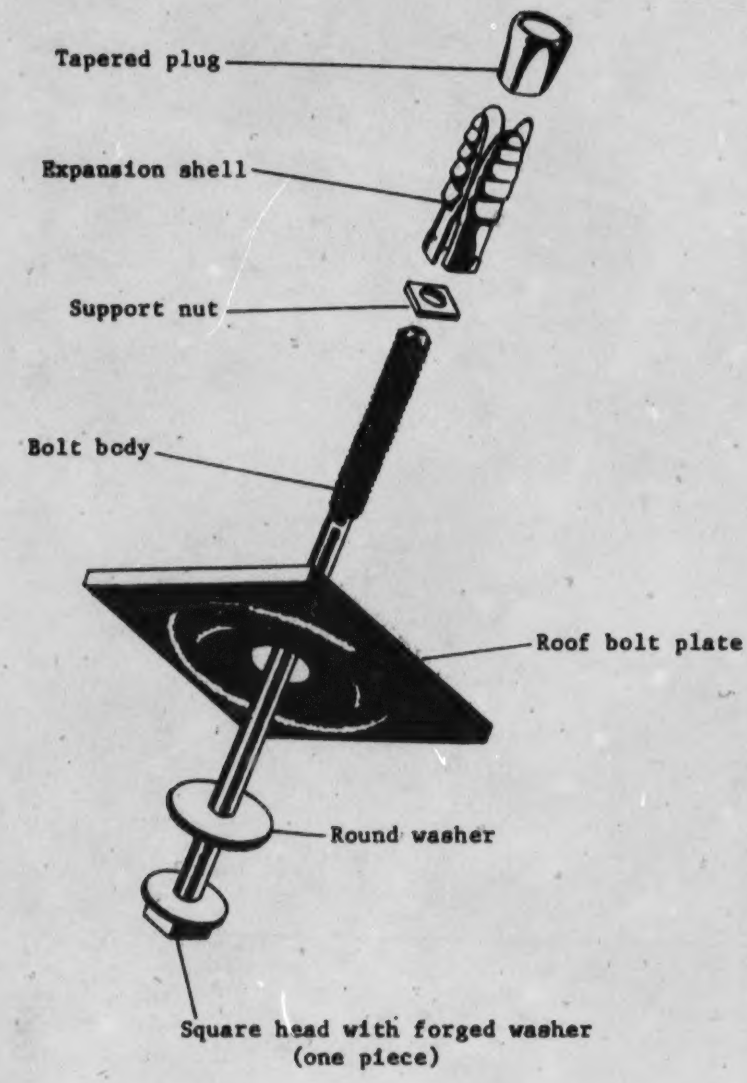
The roof bolts provide support by creating beams of the different rock layers — Bolts are used to bind these layers together much like the manufacture of plywood.



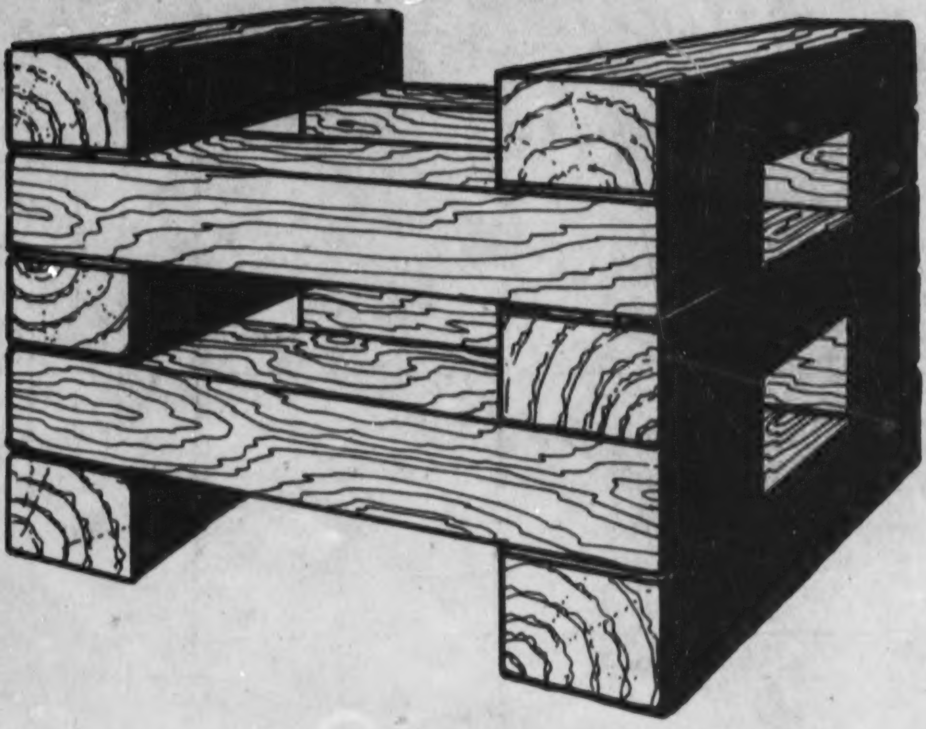
SUSPENSION METHOD

The roof bolts tie the lower layer of the roof to a stronger layer located above the main roof. The lower layer hangs from the upper layer.

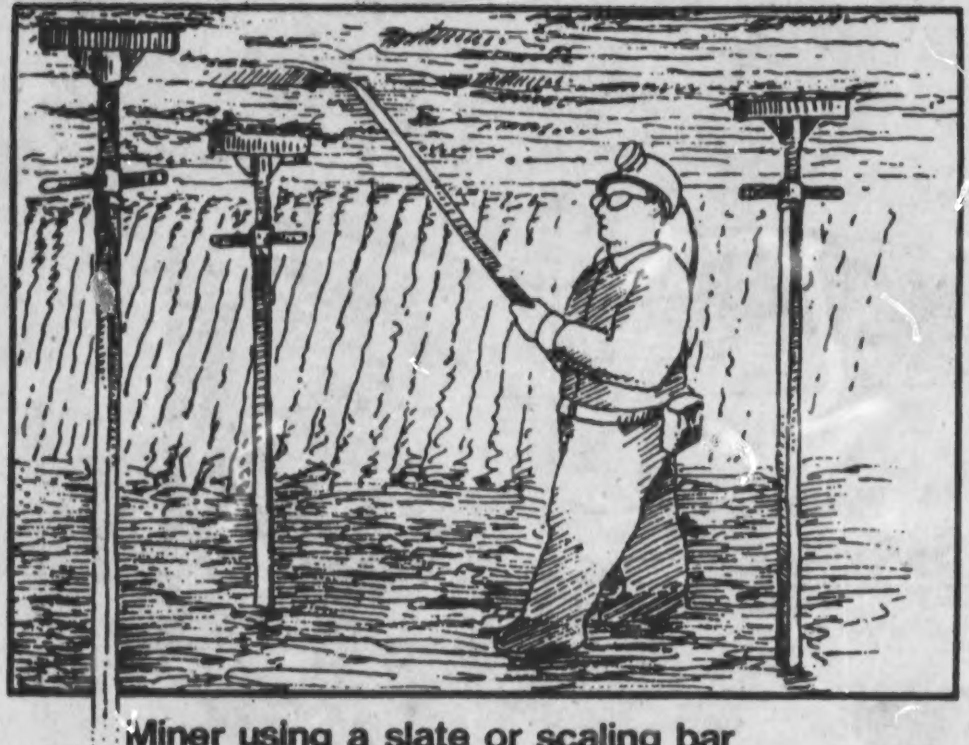
ROOF BOLT


Tapered plug
Expansion shell
Support nut
Bolt body
Roof bolt plate
Round washer
Square head with forged washer
(one piece)

CRIB



SCALING



Miner using a slate or scaling bar

SCALING RULES

1. WEAR GOGGLES.
2. BAR AT AN ANGLE.
3. PRY UP.
4. BE UNDER A SUPPORTED ROOF.
5. BALANCE YOUR BODY.
6. ENSURE THE BOTTOM IS CLEAR BEHIND YOU FOR A SAFE RETREAT.

GLOSSARY OF TERMS

Beam. A bar or straight girder used to support a span of roof between two support props or walls.

Bearing plate. A plate used to distribute a given load. In roof bolting, plate used between the bolt head and the roof.

Bolt torque. The turning force applied to a roof bolt to achieve an installed tension in footpounds.

Break line. The line along which the roof of a coal mine is expected to break, roughly following the rear edges of the pillars that are being drawn or mined.

Cap block. A flat piece of wood inserted between the top of the prop and the roof to provide bearing support.

Continuous mining. Mining in which the continuous mining machine cuts or rips coal from the face and loads it onto conveyors or into shuttle cars in a continuous operation. Thus, the drilling and shooting operations are eliminated.

Conventional mining. The cycle of operations which includes cutting the coal, drilling the shot holes, charging and shooting the holes, loading the broken coal and installing roof support.

Crib. A structure composed of frame or timber laid horizontally upon one another, or of timbers built up as in the walls of a log cabin.

Crossbar. The horizontal member of a roof timber set supported by props located either on roadways or at the face.

Entry. A coal heading. A working place where the coal is extracted from the seam in the inital mining.

Face. An area in a coal mine where coal is being extracted from its natural deposit in the earth. The face is formed during the mining cycle.

Fault. A fracture in the coal seam accompanied by displacement.

Fissure. An extensive crack, break, or fracture in the rocks.

Gob area. Coal and other minerals that are not marketable in the mine. That part of the mine where coal has been extracted and the resulting space, more or less, filled up by fallen material.

Immediate roof. The roof immediately above the coal bed.

Inby. Toward the working face or interior of the mine, away from the shaft or entrance.

Kettle bottom. A smooth, rounded piece of rock, cylindrical in shape, which may drop out of a roof or a mine without warning.

Lamination. Process in roof bolting by which the bolts are used to bind different roof strata together under a certain amount of pressure, much like the manufacture of plywood.

Longwall mining. A method of working coal seams believed to have originated in England toward the end of the 17th Century. The seam is removed in one operation by means of a long working face or wall advancing in a continuous line which may be several hundred yards long.

Main roof. Roof above the immediate top. It may vary in thickness from a few feet to several thousand feet depending on the depth of the coal.

Mine roof. The layer of hardened clay, limestone, sandstone, or other material that lies over the coal bed; rock or other material above the coal seam.

Overburden. The material of any nature, consolidated or unconsolidated, that overlies a deposit of coal.

Pillar. An area of coal left to support the overlying strata in a mine; sometimes left permanently to support surface works or against old workings containing water.

Pot. A rounded mass of roof slate resembling an iron pot. It is separated from the other slate by old mud cracks and is liable to fall without warning.

Rib. The side of a pillar or the wall of an entry.

Roof bolt. A long steel bolt inserted in a drilled hole used to support mine roof; the unit consists of the bolt, steel bearing plate, and expansion shell.

Roof jack. A screw- or pump-type hydraulic extension post made of steel used as temporary roof support.

Roof trusses. A combination of steel rods anchored into the roof to create zones of compression and tension forces and provide better support of weak roof and roof over wide areas.

Room-and-pillar. A system of mining in which the distinguishing feature is the mining of 50 percent or more of the coal or ore in the first working. The coal or ore is mined in rooms separated by narrow ribs or pillars which are left to hold the roof. The rooms are driven parallel with one another, and the room faces may be extended parallel, at right angles, or at an angle.

Shale. A rock formed by consolidation of clay, mud, or silt; has a laminated structure; composed of minerals essentially unaltered since deposition.

Slate bar. The proper long handle tool used to pry down loose and hazardous material from roof, face, and ribs.

Spalling. The sloughing, slow crumbling, of material from roof, face, or rib.

Sloughing. The slow crumbling and falling away of material from roof, rib, and faces.

Squeeze. The roof settles without breaking and gradual upheaval of mine floor due to weight of mine roof.

Stratum. A sheetlike layer of sedimentary rock.

Suspension. The act of hanging. Weaker strata hanging from stronger overlying strata by means of roof bolts.

Tension. Stretching applied to rock as a result of mining, or to a roof bolt or roof truss as a result of tightening.

Timbering. The setting of timber supports in mine workings or shafts for protection against falls from roof, face, or rib.

Treated timbers. Timber treated with chemicals such as creosote, zinc chloride, or by other methods to season and extend useful life.

IX. Ventilation
  A. Purpose
    1. The primary purpose of mine ventilation is to provide a healthy and safe working environment for the miner.
  B. Aims
    1. The ventilation system must provide enough air to the face to dilute the gas that is freed and to hold down the dust levels as the coal is removed.
  C. Terms and definitions
    1. Coal dust (bug dust)
      a) Is the fine coal that comes from the drilling or cutting of coal, usually by machines.
    2. Float dust
      a) If the dust becomes suspended, or floats through the air, it is commonly referred to as float dust.
    3. Firedamp
      a) Is a mixture of methane and air.
    4. Main fans
      a) Are large mechanical fans located on the surface that are employed to produce the air that is used to ventilate the mine.
    5. Exhaust fans
      a) Are fans that pull air through the mine.
    6. Blow fans
      a) Are fans that push air through the mine.
    7. Intake
      a) Is the mine passage that supplies the fresh air to the working section.
    8. Return
      a) Is the mine passage that old (used) air travels out of the mine.
    9. Air split
      a) Is a portion of air that has been separated from the main intake air passage for the purpose of ventilating a working section.
    10. Stopping
      a) Are structures that are erected across mine passageways to keep the air moving up to the working face.
    11. Check curtain
      a) Is a temporary stopping erected of brattice cloth installed across a mine passage to deflect the air while allowing the travel of miners and machines.
    12. Door
      a) Are usually wood installations used only to deflect air while allowing the passage of miners and machinery.
    13. Overcast/undercast
      a) Is a ventilation control device that permits two airstreams to cross each other.
    14. Regulator
      a) Is a ventilation control device constructed similarly to a masonry stopping that has a sliding door to regulate the air that flows in air splits.

15. Line curtain
    a) Is a ventilation control device constructed of brattice cloth that is used to direct the air that is flowing in that crosscut into the room and up to the face.
16. Anemometer
    a) Is an instrument used for the purpose of measuring the airflow (velocity) in a mine passage.
17. Auxiliary ventilation
    a) Is a secondary ventilation system that is usually employed during continuous miner operations to reduce methane and coal dust concentrations at the working face.
18. "Short circuiting"
    a) Is the result of an air leakage in a brattice or stopping permitting the air to go around that face through a crosscut and flow into a return airway before ventilating the face.
19. Bleeder entries
    a) Are panel entries driven on a perimeter of the block of coal being mined and maintained as exhaust airways to remove methane concentrations.
20. Spad
    a) Is a flat spike that has a hole drilled in one end that is used to suspend a curtain from the roof or other material.

D. Air Splits
   1. Separation
      a) To prevent old air that has been used to ventilate one section from coming into an other section.
      b) They are also kept separated so that the amount of air flowing in that split can be regulated.

E. Primary (main) ventilation system
   1. Installations
      a) Main fan (fans)
      b) Overcasts/undercasts
      c) Permanent stoppings
      d) Temporary stoppings
      e) Doors
      f) Check curtains
      g) Line curtains/auxiliary ventilation
      h) Regulators

F. Secondary ventilation system
   1. Installations
      a) Permanent stoppings
      b) Temporary stoppings
      c) Doors
      d) Check curtains
      e) Line curtains/auxiliary ventilation
      f) Regulators
      g) Bleeder entries

G. Overcasts
   1. Advantages
      a) They will not collect moisture at the crossing.
      b) Overcasts improve the movement of miners and equipment through the elimination of doors.
      c) Overcasts keep intake air where it should be.

H. Undercasts
  1. Disadvantages
    a) They will collect moisture at the crossing.

I. Responsibility
  1. Persons who have reason to pass through doors or check curtains are responsible for seeing that they are properly closed.
  2. The sliding door to a regulator should never be tampered with or adjusted except by an authorized and qualified person.
  3. Changes or adjustments in the ventilating current should be done on an idle day while no employees are working.

J. Check curtain
  1. Installation
    a) Select a place in the entry suitable for travel.
    b) Remove uneven ribs or protruding brows.
    c) Remove any other loose objects.
    d) Install check curtain to minimize air leakage.

K. Exception
  1. Air used at the working face can be used to ventilate pillared or robbed areas.

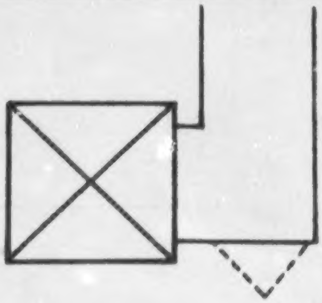
X. Mine maps and legends
A. Purpose
1. The primary purpose of the map to the underground miner is to show the ventilation plan and escapeways for all the different working sections.
B. Legend
1. Is an explanation of the symbol.
2. The legend interprets the symbols that appear on the map.
C. Symbols
1. Are signs or objects used in place of the words contained in the legend.
2. Terms represented by signs or objects are as follows:
a) Intake air
b) Return air
c) Regulator
d) Overcast
e) Undercast
f) Belt
g) Track
h) Permanent stopping
i) Excapeway
j) Check curtain
k) Line curtain
l) Door
m) Tail piece

PART VII

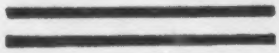
ROCK DUSTING

XI. Rockdusting and fire protection
- A. Rockdust
  - 1. Purpose
    - a) When mixed with coal dust, it very much reduces the danger of the coal catching fire and causing an explosion.
  - 2. Requirements
    - a) The roof, ribs, and floor of the mine must be rockdusted to within forty (40) feet of the working face, including the last open crosscut.
    - b) In the face area and in intake air passages, enough rockdust must be mixed with the coal dust so that sixty-five (65) percent of the material is non-combustible.
    - c) In abandoned areas (unless sealed) and in return air passages of the mine, the dust content must be eighty (80) percent non-combustible material on the surface.
    - d) Kentucky and Federal mining laws also require addtional rockdust to be added all the way to the face in certain cases along with additional rockdust for the presence of methane gas.
- B. Water
  - 1. Water, with or without a wetting agent, or other no less effective methods approved by the secretary or his authorized representative shall be applied to coal dust on the ribs, roof, and floor to reduce dispersibility and to minimize the explosion hazard.

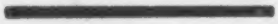
Mine Map Symbols



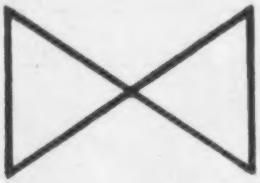
Fan



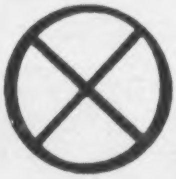
Permanent Stopping



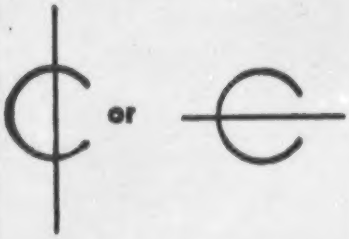
Temporary Stopping



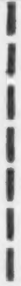
Overcast



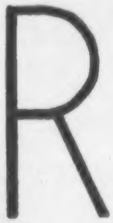
Undercast



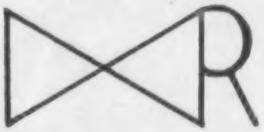
Check Curtain



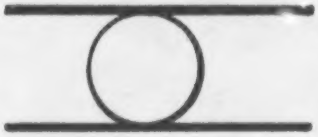
Line Brattice



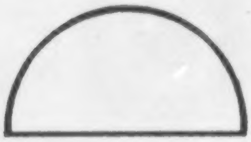
Regulator



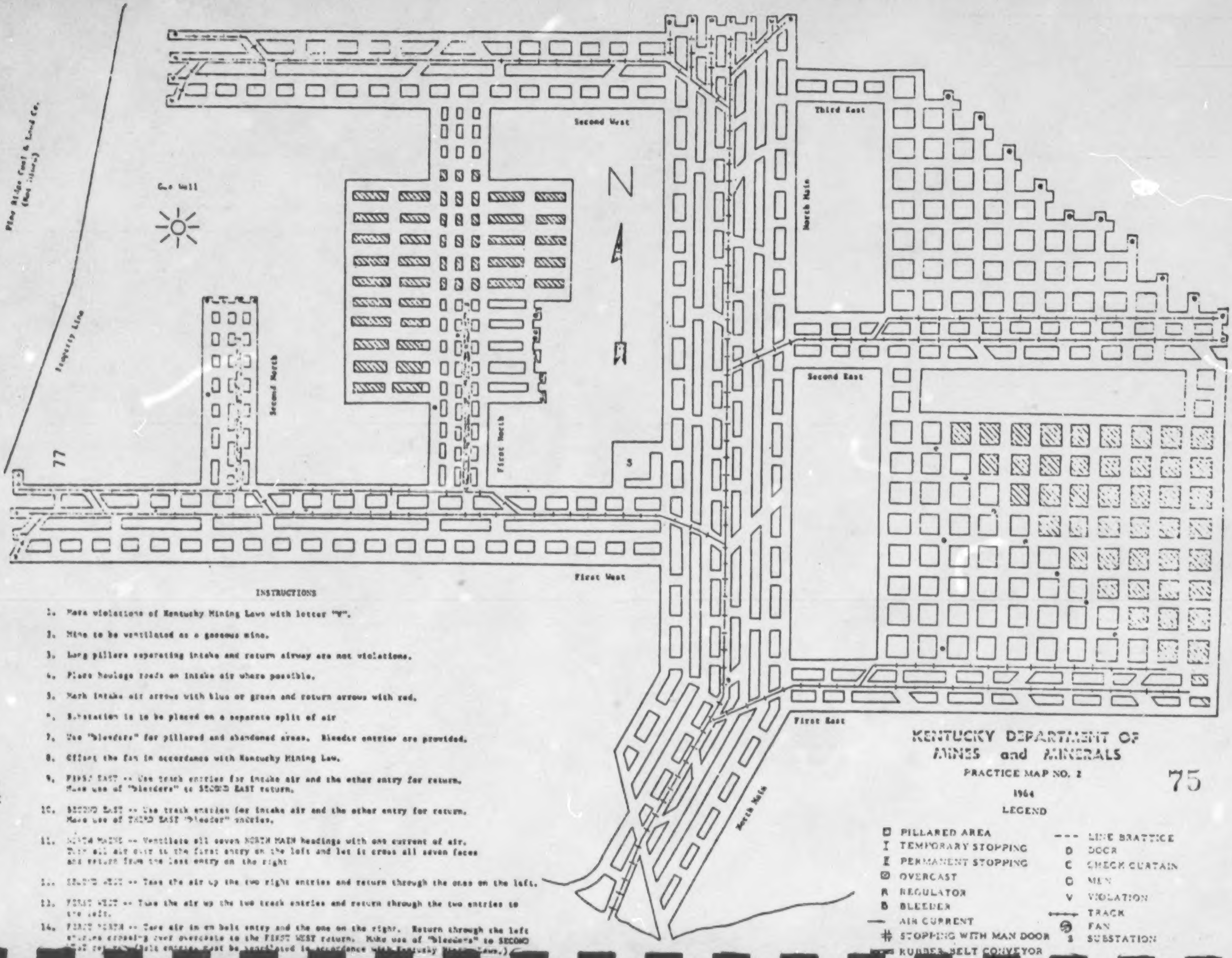
Belt Regulator



Box Check



Mine Door



INSTRUCTIONS

1. Mark violations of Kentucky Mining Laws with letter "V".
2. Mine to be ventilated as a gaseous mine.
3. Long pillars separating intake and return airway are not violations.
4. Place haulage roads on intake air where possible.
5. Mark intake air arrows with blue or green and return arrows with red.
6. Substation is to be placed on a separate split of air
7. Use "bleeders" for pillared and abandoned areas. Bleeder entries are provided.
8. Offset the fan in accordance with Kentucky Mining Law.
9. FIRST EAST -- Use track entries for intake air and the other entry for return. Make use of "bleeders" to SECOND EAST return.
10. SECOND EAST -- Use track entries for intake air and the other entry for return. Make use of THIRD EAST "bleeder" entries.
11. NORTH MAINS -- Ventilate all seven NORTH MAIN headings with one current of air. Turn all air over to the first entry on the left and let it cross all seven faces and return from the last entry on the right
12. SECOND WEST -- Take the air up the two right entries and return through the ones on the left.
13. FIRST WEST -- Take the air up the two track entries and return through the two entries to the left.
14. FIRST NORTH -- Take air in on belt entry and the one on the right. Return through the left entries crossing over overcasts to the FIRST WEST return. Make use of "bleeders" to SECOND WEST return. (Belt entries must be ventilated in accordance with Kentucky Mining Laws.)

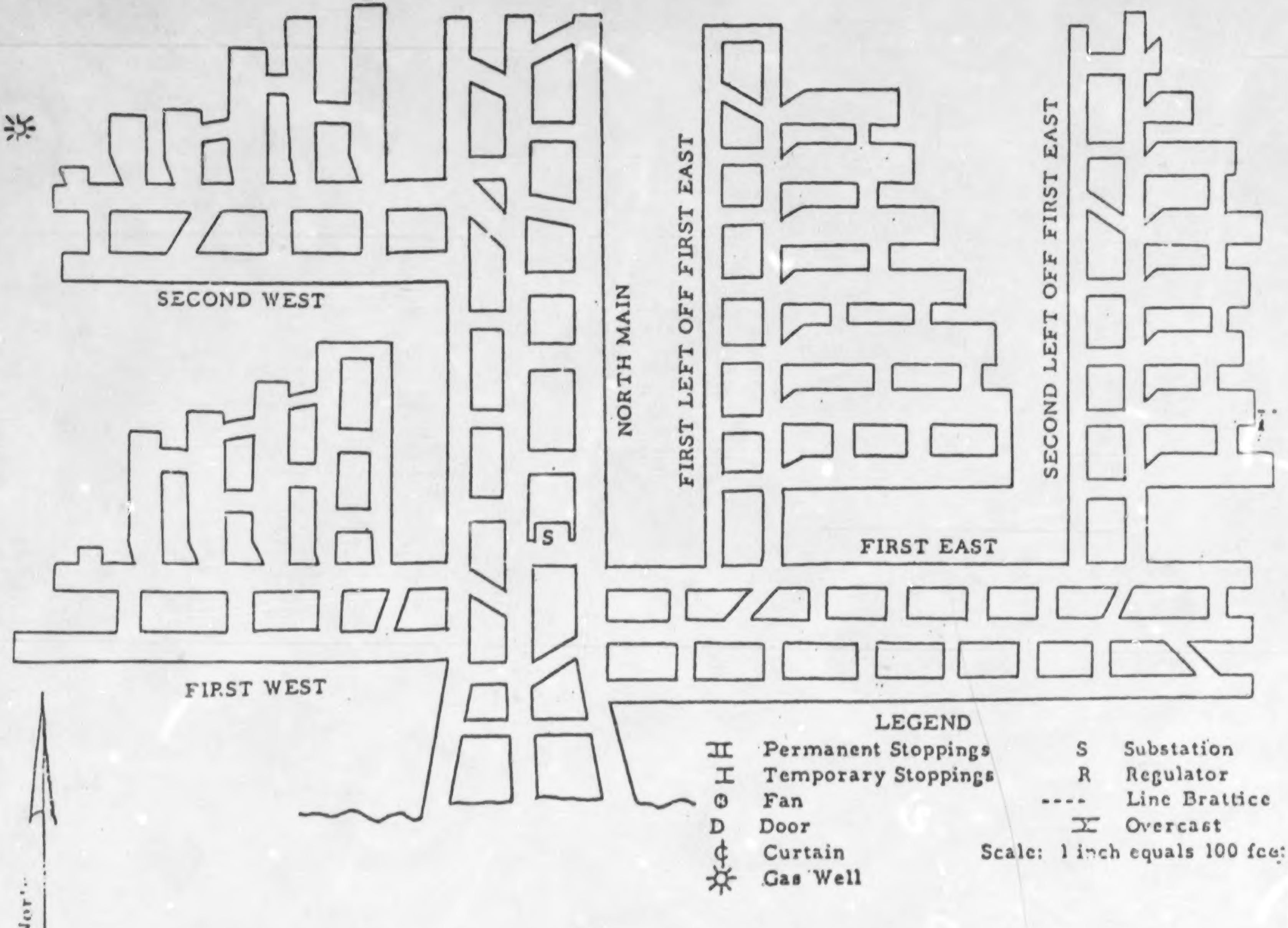
KENTUCKY DEPARTMENT OF
MINES and MINERALS

PRACTICE MAP NO. 2

1964

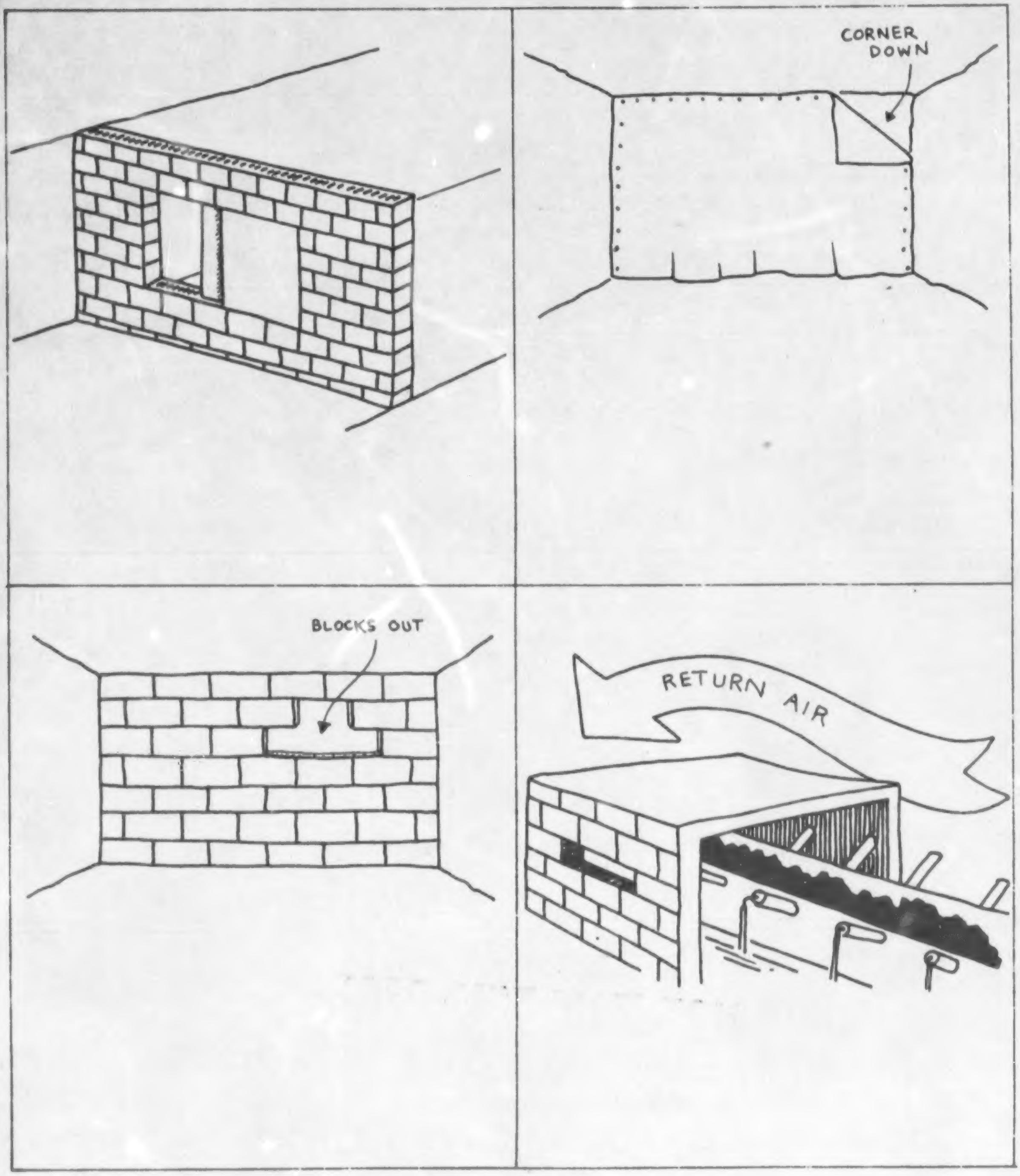
LEGEND

- ☐ PILLARED AREA
- I TEMPORARY STOPPING
- I PERMANENT STOPPING
- ⊘ OVERCAST
- R REGULATOR
- B BLEEDER
- — AIR CURRENT
- # STOPPING WITH MAN DOOR
- ▬ RUBBER BELT CONVEYOR
- - - - LINE BRATTICE
- D DOOR
- C CHECK CURTAIN
- O MEN
- V VIOLATION
- ↔ TRACK
- ⊗ FAN
- S SUBSTATION


SECOND WEST
FIRST WEST
NORTH MAIN
FIRST LEFT OFF FIRST EAST
SECOND LEFT OFF FIRST EAST
FIRST EAST
S
North
LEGEND
Permanent Stoppings
Temporary Stoppings
Fan
D Door
Curtain
Gas Well
S Substation
R Regulator
Line Brattice
Overcast
Scale: 1 inch equals 100 feet

PROPERLY VENTILATED MINE USING SPLIT SYSTEM

Types of Regulators


CORNER DOWN
BLOCKS OUT
RETURN AIR

GLOSSARY OF TERMS

Active workings. Any place in a mine where miners are normally required to work or travel.

Air split. The division of a current of air into two or more parts.

Black damp. A term generally applied to carbon dioxide. Strictly speaking, it is a mixture of carbon dioxide and nitrogen. It is also applied to an atmosphere depleted of oxygen, rather than having an excess of carbon dioxide.

Certified. "Certified" or "registered" as applied to any person means a person certified or registered by the State in which the coal mine is located to perform duties prescribed by such titles, except that, in a State where no program of certification or registration is provided or where the program does not meet at least minimum federal standards established by the Secretary, such certification or registration shall be by the Secretary.

Coal dust. Particles of coal that can pass a No. 20 sieve.

Firedamp. The combustible gas, methane, CH_4. Also, the explosive methane-air mixtures with between 5 percent and 15 percent methane.

Float dust. Fine coal-dust particles carried in suspension by air currents and eventually deposited in return entries. Dust consisting of particles of coal that can pass through a No. 200 sieve.

Permissable. That which is allowable or permitted. It is most widely applied to mine equipment and explosives of all kinds which are similar in all respects to samples that have passed certain tests of the USBM and MSHA and can be used with safety in accordance with specified conditions where hazards from explosive gas or coal dust exist.

Qualified. "Qualified person" means, as the context requires, (1) an individual deemed qualified by the Secretary and designated by the operator to make the tests and examinations required by this Act; and (2) an individual deemed, in accordance with minimum requirements to be established by the Secretary, qualified by training, education, and experience, to perform electrical work, to maintain electrical equipment, and to conduct examinations and tests of all electric equipment.

Respirable dust. Dust collected with an MRE instrument or any other dust sampling device approved by the Secretary and the Secretary of Health, Education and Welfare.

Respirable dust sample. A sample collected with an approved coal mine dust sampler unit attached to a miner, carried by him, or so positioned as to measure the concentration of respirable dust to which he is exposed, and operated continuously over an entire work shift of such mine.

Face. The principal operating place in a mine. The working place where fresh ore or coal is exposed and extracted. A mine may have many operating faces.

Fall. A mass of roof rock or coal from the roof which has fallen in any part of a mine.

Fan, auxiliary. A small, portable fan used to supplement the ventilation of an individual working place.

Fan signal. Automation device designed to give alarm if the main fan slows down or stops.

Flame-resistant. Any material that resists combustion.

Float dust. Fine coal-dust particles carried in suspension by air currents and eventually deposited in return entries. Dust consisting of particles of coal that can pass through a No. 200 sieve.

Floor. Any material that is put back in place of the extracted ore to provide ground support.

Gangway heading. Passageway into an anthracite mine used for haulage. Intake air goes into the mine through this heading.

Gob. The term applied to that part of the mine from which the coal has been removed and the space more or less filled up with waste. Also, the loose waste in a mine. Also called goaf.

Haulage. The horizontal transport of ore, coal, supplies, and waste. The vertical transport of the same is called hoisting.

Haulageway. Any underground entry or passageway that is designed for this transport, usually by the installation of track or a belt conveyor.

Heading. An entry.

Inby. In the direction of the working face.

Intake. The passage through which fresh air is drawn or forced into a mine or to a section of a mine.

Main entry. A main haulage road. Where the coal has cleats, main entries are driven at right angles to the face cleats.

Main fan. A mechanical ventilator installed at the surface; operates by either exhausting or blowing to induce airflow through mine roadways and workings.

Mine roof. The layer of hardened clay, limestone, sandstone, or other material that lies over the coalbed; rock or other material above the coal seam.

Mine ventilation. The provision of a directed flow of fresh and return air along all underground roadways, traveling roads, workings, and service parts.

Minor headings. Passageways allowing air to pass from one breast to another in an anthracite mine.

Monkey heading. Return air passage in an anthracite mine.

Outby. Nearer to the shaft, and hence farther from the working face. Toward the mine entrance. The opposite of inby.

Overcast (undercast). Enclosed airway which permits one air current to pass over (under) another without interruption.

Pillar. An area of coal or ore left to support the overlying strata in a mine; sometimes left permanently to support surface works.

Pneumoconiosis. A chronic disease of the lung arising from breathing coal dust.

Regulator. Device (wall, door) used to control the volume of air in an air split.

Respirable dust. Dust particles 5 microns or less in size.

Respirable dust sample. A sample collected with an approved coal mine dust sampler unit attached to a miner, carried by him, or so positioned as to measure the concentration of respirable dust to which he is exposed, and operated continuously over an entire work shift of such miner.

Return. The air or ventilation that has passed through all the working faces of a split.

Rib. The side of a pillar or the wall of an entry. The solid coal on the side of any underground passage.

Roof. The stratum overlying a coal seam; the overhead surface of a coal working place.

Room. An exploitation area in certain types of coal mines; rooms are separated by pillars; a room and its pillars form a panel.

Room and pillar. A system of mining in which approximately half of the coal is mined while advancing by driving side rooms off entries and leaving narrow pillars between. The pillar coal is removed by any of several robbing practices.

Safety lamp. A lamp with steel wire gauze covering every opening from the inside to the outside so as to prevent the passage of flame should explosive gas be encountered.

Seam. A stratum or bed of coal.

Shuttle car. A trackless, single-unit, self-powered haulage device used on short runs in bedded deposits to transfer broken material from the loading machine to the end of the conveyor.

Stopping. Any wall that is built to deflect or impede the flow of ventilating air.

Tailpiece. Also known as foot section pulley. The pulley or roller in the tail or foot section of a belt conveyor around which the belt turns.

Undercast. An air course carried under another air course or roadway.

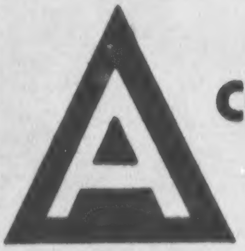
Ventilation. The mechanism and processes of maintaining an efficient mine atmosphere, that is, air that is relacively free from explosive and toxic pollutants and that is at a temperature at which labor can be efficiently performed.

Working face. Any place in a mine where material is extracted from its natural deposit during a mining cycle.

Working place. From the inby side of the last open crosscut to the face.

Working section. From the faces to the point where coal is loaded on belts or rail cars to begin its trip.

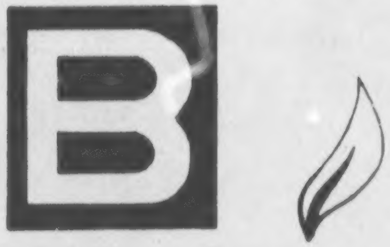
The Four Classes of Fires



COMBUSTIBLE MATERIAL

Coal
Gob Piles
Timber
Smoldering Trash
Card Board Boxes
Wooden Pallets
Dry Rags
Tires

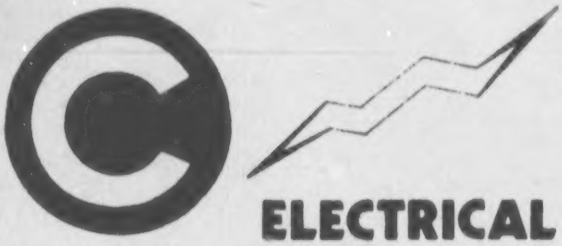
THE TRIANGLE IS COLORED GREEN



FLAMMABLE LIQUID

Lubricating Oils
Greases
Fuel Oils
Gasoline

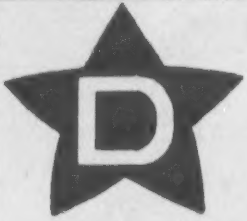
THE SQUARE IS COLORED RED



ELECTRICAL

Electrical Motor
Trolley Wire
Battery Equipment
Battery Charging Station
Junction Box
Transformer
Circuit Breaker

THE CIRCLE IS COLORED BLUE

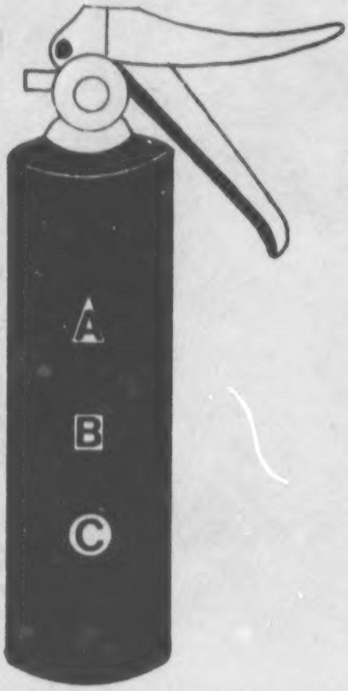


COMBUSTIBLE METAL

Sodium
Titanium
Zirconium
Magnesium

THE STAR IS COLORED YELLOW

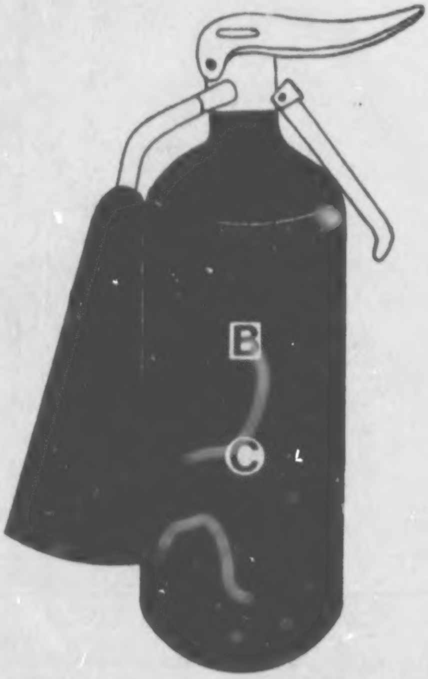
Fire Extinguishers



MULTI-PURPOSE

for all types of fires except metal fires

Class A	ordinary combustibles
Class B	grease and other flammable liquids
Class C	electrical fires



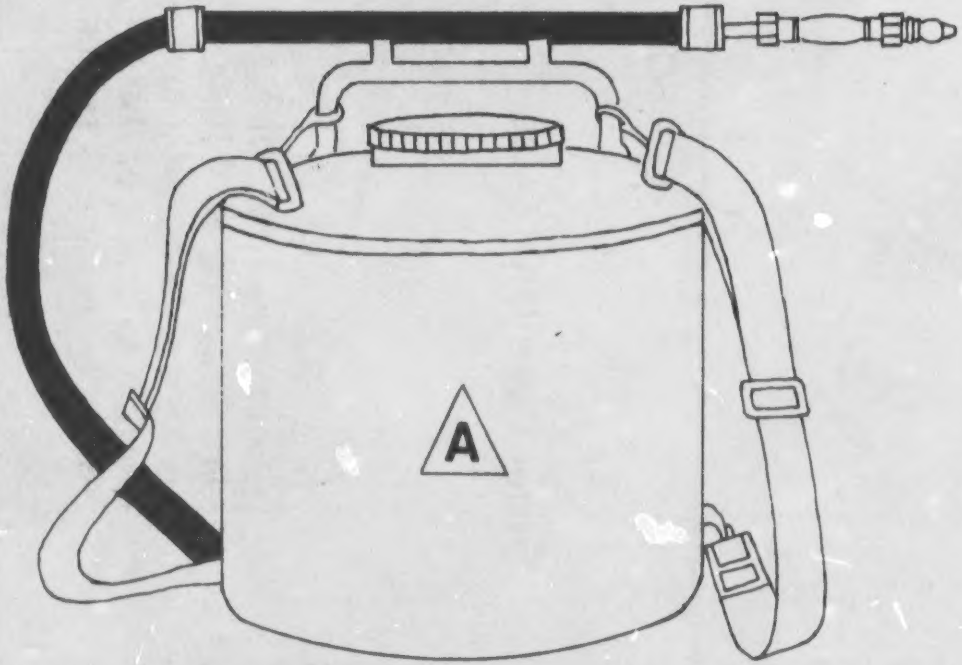
CARBON DIOXIDE

- for Class B or Class C fires

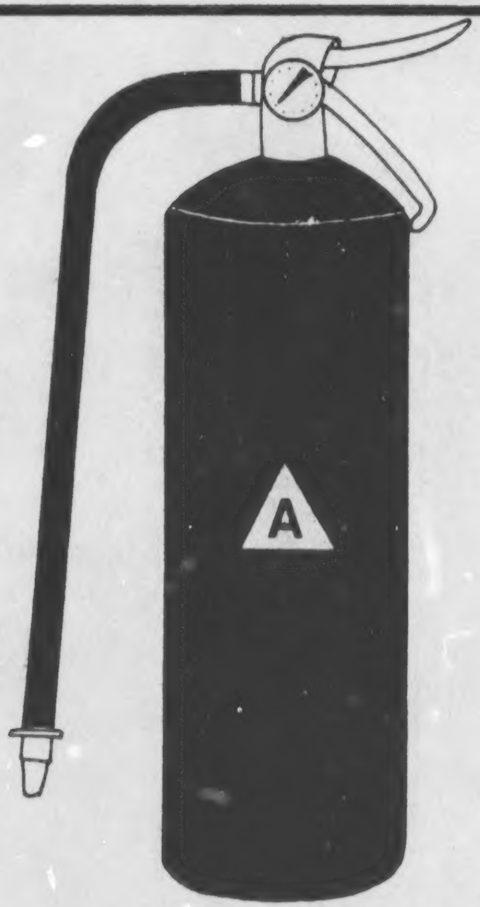
Tips on Use:
Stand close to the fire and aim at the base of the fire, using a side-to-side sweeping motion to smother the fire. Stand by in case of reflash.

Water Carriers

- for Class A fires only



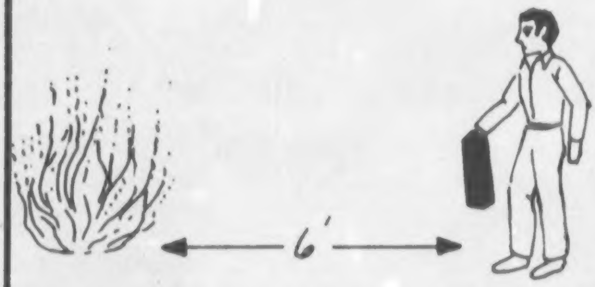
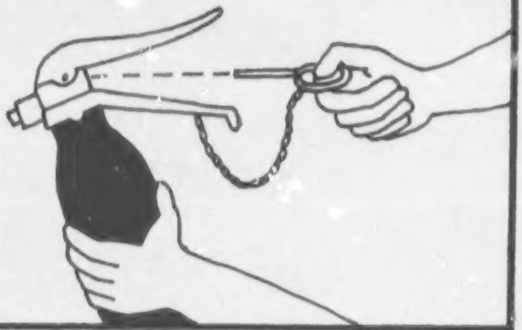
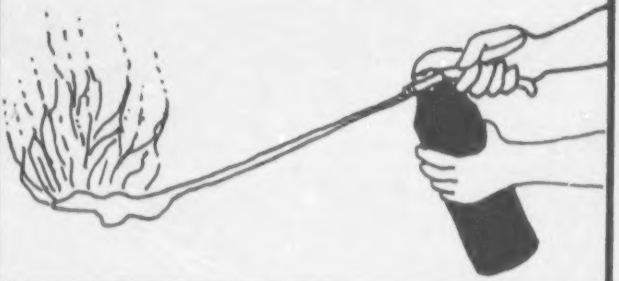
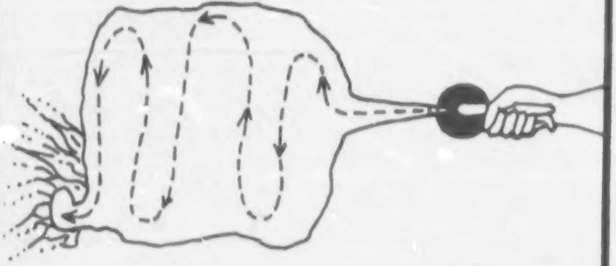
PUMP TANK



PRESSURIZED WATER

Do not use water on Class B and C fires

Typical Extinguisher Operation

● **Approach no closer than six feet from the fire.**	
● **Grasp the extinguisher firmly and pull out the lock pin.**	
● **Aim the nozzle at the base of the fire. Squeeze the handles.**	
● **Use a side to side sweeping motion to blanket the fire.**	

Glossary of Terms

Combustible. Capable of burning.

Extinguish. To put out, as a light or fire.

Flammable. Capable of being easily ignited.

Fluid. A substance that can flow, such as liquid or gas.

Multi-purpose. For more than one use.

Portable. Capable of being easily transported.

Site-evacuation plan. A plan, required by Federal law, that provides for the quick, safe exit of miners from various surface mine areas in the event of an emergency.

Ventilate. To cause fresh air to circulate through.

Visible. Capable of being seen.

PART VIII

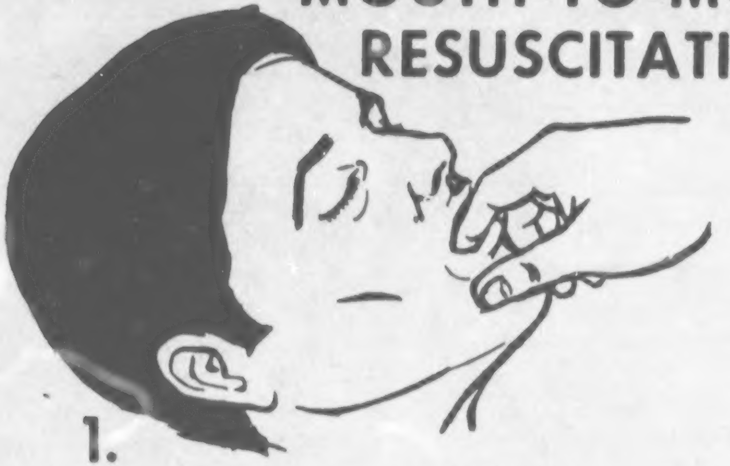
FIRST AID

XII. First aid
- A. Fundamental of first aid
    1. Artificial respiration
    2. Control of bleeding
    3. Treatment for physical shock
    4. Care of open and closed wounds, burns and scalds
    5. Care of dislocations and fractures
    6. Handling and transportation of the sick or injured

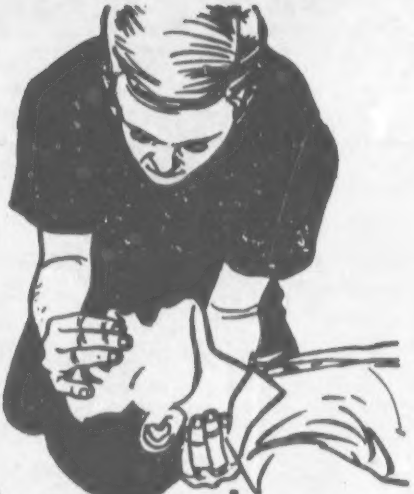
I. Introduction to first aid

1. First aid is the emergency care of a person who is injured or ill, to prevent death or further injury, to relieve pain, and to counteract shock until medical aid can be obtained.
2. First aid men are taught to send for medical aid in all cases of serious injury and to be sure that the patient sees a physician as soon as possible, even in minor injury.
3. The principal aims of first aid are as follows:
   - a) Prevention of further injury
   - b) Treating life-threatening conditions
   - c) Protecting injuries from infections and complications
   - d) Make the patient as comfortable as possible to conserve strength
   - e) Transporting the patient to medical assistance, when required, in such a manner as not to complicate the injury or subject him to any more discomfort than is absolutely necessary.
4. As a first-aid person these are the things you should do:
   - a) Be calm
   - b) Take command
   - c) Keep onlookers away from the patient
   - d) Locate the injury
   - e) If artificial respiration is needed, start it without delay
   - f) Look for bleeding and check it
   - g) Treat for physical shock
   - h) Keep the patient lying down
   - i) Use a knife or scissors to remove clothing
   - j) Cover all wounds completely with a sterile bandage compress, or sterile gauze in case of large wounds and a triangular or cravat bandage, except wounds of the eye, nose, chin, fingers, or toes, where a sterile bandage compress only is used.
   - k) Do not allow the fingers or instruments to touch a wound
   - l) Remove any loose foreign objects from a wound with a piece of sterile gauze, but do not attempt removal if embedded in the wound.
   - m) Look for fractures; never move a patient unless absolutely necessary, until splints have been applied.
   - n) Leave reduction of dislocations or fractures to a surgeon, except dislocations of jaw, fingers, and toes.
   - o) Place a sterile bandage compress and a bandage over a compound fracture without undue pressure before applying splints.
   - p) Exclude air from burned surfaces as quickly as possible by using a suitable dressing.
   - q) Place the patient on the stretcher carefully, avoiding jerky movements, and carry him to safety. Always test a stretcher before placing a patient on it.
   - r) When delivering the patient to an ambulance or to a hospital, the first-aid man should always notify them if a tourniquet is in place, and how long it has been in place.

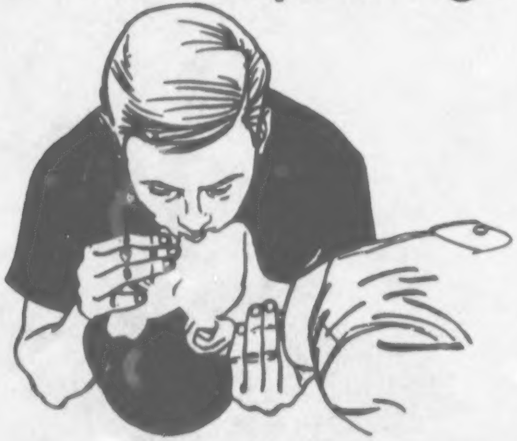
MOUTH-TO-MOUTH RESUSCITATION



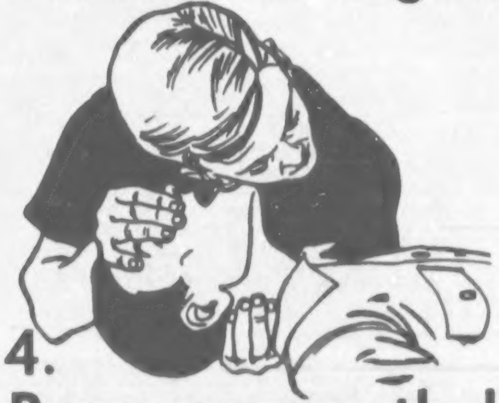
1.
Clear the air passage.



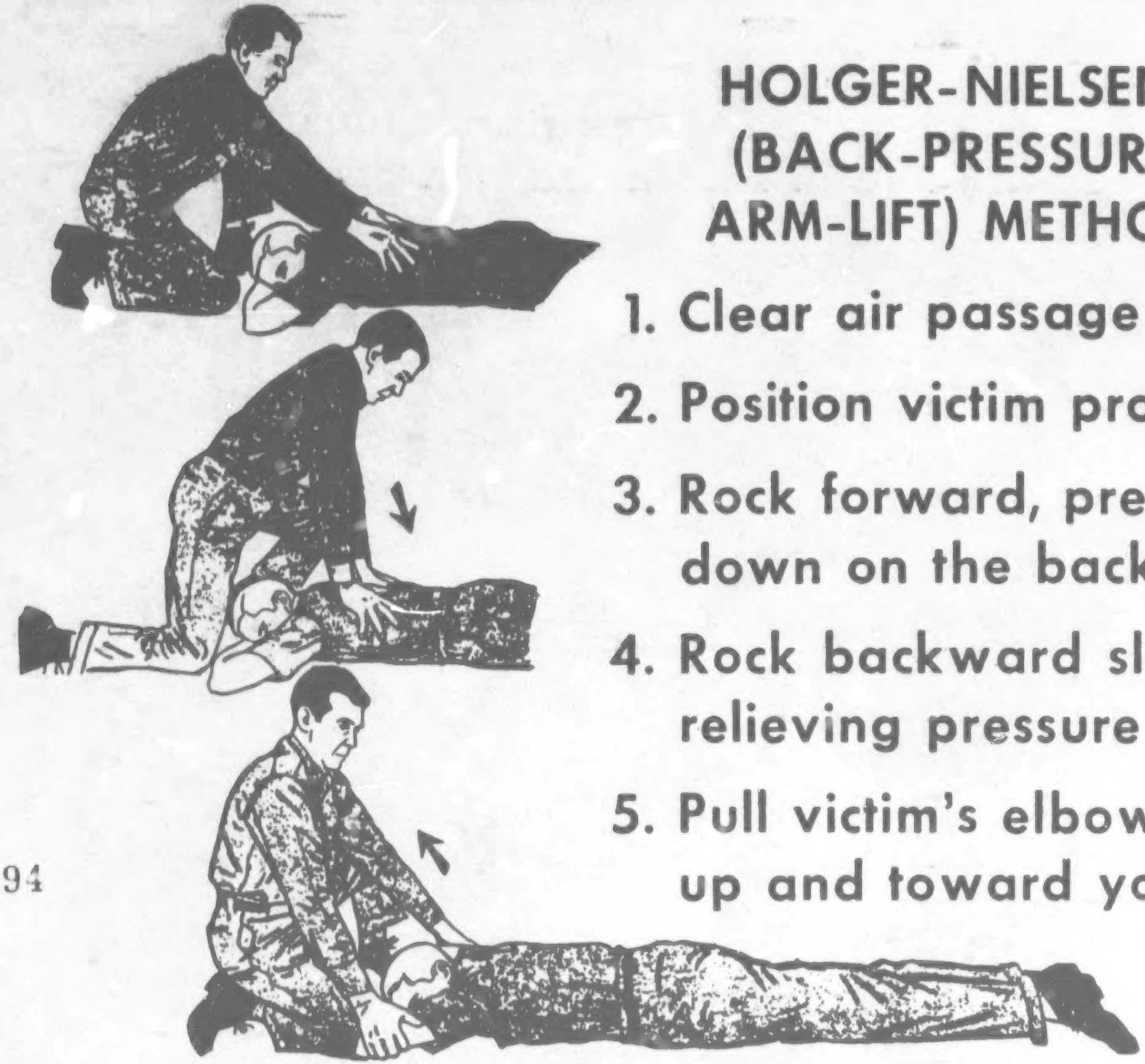
2. Lift up under neck (extend chin) and pinch the nostrils together.



3.
Inhale deeply. Breathe into victim's mouth.



4.
Remove mouth, listen for return flow of air.



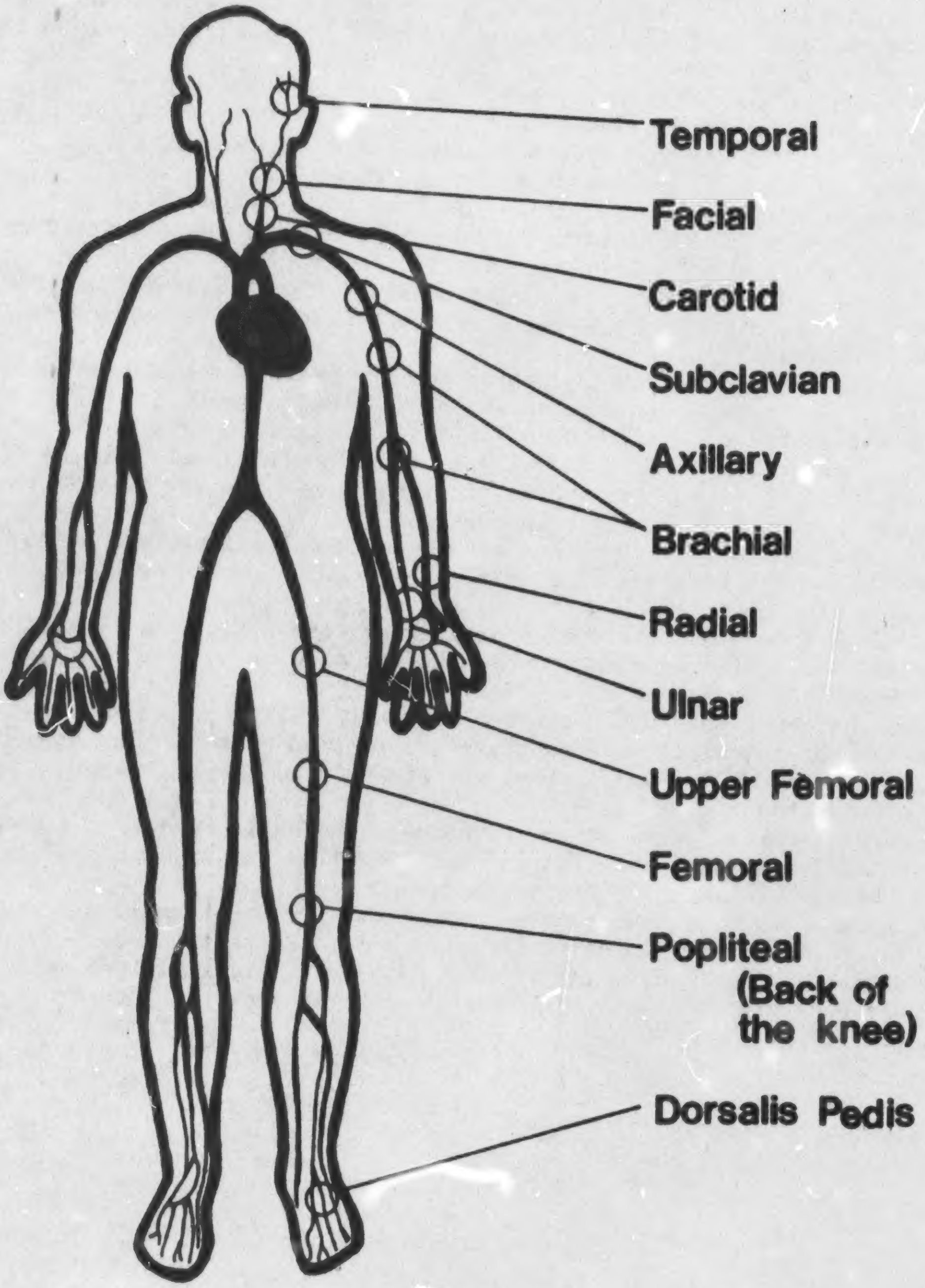
HOLGER-NIELSEN (BACK-PRESSURE ARM-LIFT) METHOD

1. Clear air passage
2. Position victim properly
3. Rock forward, press down on the back
4. Rock backward slowly, relieving pressure
5. Pull victim's elbows up and toward you

I. Artificial respiration

1. Artificial respiration is the procedure for causing air to flow into and from the lungs when natural breathing has ceased or when it is very irregular and feeble.
2. The most frequent conditions under which artificial respiration may be required are electric shock, drowning, suffocation, and gas poisoning.
3. Do not delay resuscitation to loosen the victim's clothes, to warm him, or to administer stimulants.
4. If possible, incline the victim's body slightly to permit better drainage of fluids from the respiratory system.
5. As soon as artificial respiration has been started and while it is being continued, an assistant should remove all foreign objects from the victim's mouth. Halger-Nielsen, Schafer methods.
6. Check the mouth and throat for obstructions before beginning mouth-to-mouth resuscitation, and see that the tongue is forward and the chin extended.
7. If it is necessary to move a patient before he is breathing normally, continue artificial respiration while he is being moved.
8. It is advisable to supplement artificial respiration by administering oxygen, especially when the quantity of fresh air supplied to the patient by artificial respiration is inadequate, as is likely if the patient has been breathing poisonous gases.
9. After the victim is revived and conscious, slowly give him a stimulant, such as one (1) teaspoon of aromatic spirits of ammonia in half (½) a glass of water.
10. The mouth-to-mouth technique of artificial respiration is the most practical and efficient method of resuscitation of an individual of any age who has stopped breathing.
11. Also, the mouth-to-mouth technique of artificial respiration enables the rescuer to obtain more accurate information on the volume, pressure and timing of efforts to inflate the victim's lungs than is afforded by other methods.
12. The most important element in mouth-to-mouth respiration is the properly extended position of the head and neck to allow an adequate passage in the throat for air to enter the lungs.
13. In certain cases, mouth-to-nose resuscitation is preferred, particularly in cases of drowning in which the victim's jaws are clenched.
14. In performing artificial respiration using the Holger-Nielsen method, changing operators should always be done without altering the rhythm of the stroke.

PRESSURE POINTS


Temporal
Facial
Carotid
Subclavian
Axillary
Brachial
Radial
Ulnar
Upper Femoral
Femoral
Popliteal (Back of the knee)
Dorsalis Pedis

I. The six (6) effective methods of controlling bleeding are:
   1. Direct pressure
   2. Elevation of affected part
   3. Cold applications
   4. Digital pressure
   5. Constricting bandage) Indirect pressure
   6. Tourniquet)

II. The tourniquet may be used to control arterial bleeding when applied properly at the following locations on the human body:
   1. Upper extremities (arms)
   2. Lower extremities (legs)

III. The tourniquet must not be used to control arterial bleeding at the following locations on the human body:
   1. Fractures or wounds of the head
   2. Wounds of the eye
   3. Compound fractures

IV. Digital pressure points that control the flow of blood to the head, face and neck must not be cut off more than 1 or 2 minutes.

V. Exception to the rule applicable to tourniquets -
In the event of an amputation of an arm or leg, a doctor must remove it.

VI. When there is severe wounds and bleeding of the hand or foot, separate fingers or toes with sterile gauze.

VII. To control bleeding from an artery, a pressure point is selected between the heart and wound. Normally, this will be a pressure point above the wound.

VIII. To control bleeding from a vein, pressure is applied at a point below the wound, on the side of the wound away from the heart.

IX. A constricting bandage, unlike a tourniquet, pressure is applied with a square knot over the artery or vein at a pressure point near the wound (below or above, whichever is applicable).

I. Physical shock is a sudden depression of the nervous system.

II. The causes of physical shock are:
   1. Severe loss of blood
   2. Intense pain
   3. Severe or extensive injury
   4. Burns
   5. Anxiety
   6. Poisonous gases
   7. Sight of blood or injury

III. The symptoms of physical shock are:
   1. Dull, chalk-like appearance to the victim's skin
   2. Anxious or dull expression
   3. Shallow or irregular breathing
   4. Weak, rapid pulse
   5. Cold, moist skin
   6. Possible vomiting

IV. The treatment for physical shock is:
   1. Lay the victim flat
   2. Elevate the feet at least six (6) inches or more
   3. Clear mouth of foreign objects
   4. Loosen tight clothing at neck, waist, wrist, and legs
   5. Keep the victim warm and dry
   6. Give stimulants when necessary.

V. Do not lower the person's head if you suspect he has a fractured skull, bleeding from the head, sunstroke, or apoplexy.

VI. Fainting is a temporary loss of consciousness due to an inadequate supply of oxygen to the brain.

VII. Fainting may be caused by:
   1. Injury
   2. Physical or mental exhaustion
   3. Excessive heat
   4. Lack of air
   5. Intense emotion

IX. Symptoms of fainting are:
   1. Dizziness
   2. Perspiration of the forehead
   3. Weaving or sinking to the ground
   4. Weak and rapid pulse
   5. Shallow breathing

X. Treatment for fainting:
   1. Lay the victim flat, or lower his head below the rest of his body
   2. Cleanse his mouth
   3. Loosen clothing at the neck
   4. Give aromatic spirits of ammonia or smelling salts by inhalation
   5. Keep patient quiet and warm. Do not allow patient to sit up for at least one-half (30 minutes) hour.

I. Open wounds
   1. An "open" wound is any break in the skin.

II. Four (4) types of open wounds are:
   1. Abrasion
   2. Incision
   3. Laceration
   4. Puncture

III. The most common wounds are:
   1. Head wounds
   2. Eye wounds
   3. Arm wounds
   4. Leg wounds
   5. Foot wounds
   6. Hand wounds

IV. Closed wounds
   1. "Closed" wounds are injuries that happen without breaking the skin.

V. Four (4) types of closed wounds are:
   1. Bruises
   2. Strains
   3. Sprains
   4. Rupture (hernia)

VI. Treatment of closed wounds
   1. Bruises
      a) Elevation of affected part
      b) Cold applications
   2. Strains
      a) Comfortable position
      b) Application of dry heat
      c) Rubbing compound (warm alcohol, witch hazel)
      d) Rest
   3. Sprains
      a) Elevation
      b) Cold applications
      c) Support and immobilization
      d) If there is doubt, treat the injury as a fracture
   4. Rupture (hernia)
      a) Lay the victim flat on his back with knees drawn up
      b) Cold applications
      c) Do not force the protrusion back

I. Burns and scalds

1. The epidermis makes up the outer most layer of skin.
2. The dermis makes up the layer of skin just below the epidermis.
3. Burns are injuries resulting from contact with dry heat such as fire, heated objects, electricity, and friction.
4. Scalds are injuries resulting from contact with wet heat such as hot solutions, steam, vapors, and chemicals, such as strong acids or strong alkalis.
5. Burns are classified by the degree of injury to body tissues as follows:
    - First degree - The outer skin is reddened and there is slight swelling;
    - Second degree - The under skin is affected and blisters are formed;
    - Third degree - The skin is destroyed and some tissues underneath are damaged.
6. In severe cases, muscles, nerves, and blood vessels may be destroyed and the whole area charred.
7. Shock is chiefly responsible for deaths that occur during the first day or two.
8. Emergency or first aid care of burns or scalds should primarily be exclusion of air from the burned area; relief of the pain that immediately follows burns; minimizing the onset of shock; and, if it occurs, giving prompt and effective treatment; and the prevention of infection.
9. Remove all clothing from the injured area, but cut around any that adheres to the skin and leave it in place.
10. Cover the burned or scalded area with a clean, cold, moist dressing (gauze or bandage material), which has been dipped into a solution of three (3) tablespoons of baking soda per quart of water (ice or cold water).
11. The burn dressing should be applied in at least four, and preferably six layers and covered with a loosely applied cover bandage.
12. Do not break blisters intentionally.
13. Always see that several layers of burn dressing separate such areas as between the fingers or toes, the ears and the side of the head, the undersurface of the arm and the chestwall, the folds of the groin, and similar places.
14. After twenty (20) minutes or more, if medical help has not arrived, begin giving at fifteen (15) minute intervals half-glass doses of a solution made by dissolving one-half (½) level teaspoon of table salt and one-half (½) level teaspoon of baking soda in a quart of water.
15. When a person has been burned by a chemical, wash the area thoroughly with clean water to dilute the chemical, and then give first aid.
16. In the treatment of all other burns, three fundamental steps should be followed; remove clothing from the burned surfaces, apply a water-soluble preparation for burns, and apply gauze or other burn dressing loosely which has been dipped in a cold solution containing three (3) tablespoons of baking soda per quart of water.

I. Fractures and dislocations

1. For the purposes of first aid, fractures are divided into two (2) groups, simple and compound.
2. In simple fractures the bone is broken, but no wounds extends from the broken ends of the bone out through the skin.
3. In compound fractures the bone is broken, and a wound extends from the bone out through the skin.
4. Broken bone, especially the long bones of the arms, and legs, often have sharp edges that may cut into blood vessels, nerves, or muscles.
5. The general symptoms of fractures are as follows:
   Pain in the region of the fracture;
   Loss of function in the case of long bones;
   Deformity or irregularity of the part;
   Moderate or severe swelling;
   In fractures of the extremities, the limbs are usually shortened.
6. Do not change the position of a person apparently suffering from fractures, until you have made a careful examination.
7. If fractures are present, make any necessary movement in a manner to protect the injured parts against further injury.
8. Splints are used to support, immobilize, and protect injured parts, such as fractures, dislocations, or suspected broken bones; and to prevent movement at the fracture and at the nearest joint.
9. Inflatable plastic splints require a minimum of dressings, and give rigid support to the injured limbs.
10. In making a splint for a fracture, it should be long enough to prevent movement at the joints on both sides of the fracture; and that, if possible, it should be as wide as the thickness of the limb to which it is applied.
11. Improvised splints should be well-padded with some soft material on the inner side and at the ends that come into contact with the body.
12. Extra padding should be placed under all hollow spaces, such as the knee, ankle, and wrist.
13. Use a thin stick or splint to slip the bandage under the body or limb.
14. In fractures of the extremities, cautiously place the limb in as nearly a natural position as possible by grasping its lower part well below the fracture but not pulling on the limb, while an assistant supports the underside of the limb on both sides of the break.
15. Before the limb is moved, apply a constricting bandage or tourniquet (whichever is most necessary) loosely, to take care of possible arterial bleeding.
16. Do not tie the knots of the bandage compress and cover bandage over the wound.
17. Insofar as possible, apply splints to fractures or suspected fractures before the patient is moved.
18. If the patient is breathing, and there is no serious bleeding, treat for shock before taking care of the fracture.
19. In very few exceptions, mentioned in the dressing for particular fractures, tie the bandages securing splints away from the splints.
20. Tie the bandages securing splints away from the splints.
21. The skull may be fractured without visible wound of the scalp.
22. All serious injuries to the head should be considered possible fractures of the skull, and, if doubt exists, treat them as such.

23. Should there be bleeding from an ear, place the head so that the affected ear is on the lower side.
24. If breathing is noisy, with bubbling through secretions, lay the patient on his side in the three-quarter prone position.
25. Rib fractures are divided into two classes, uncomplicated and complicated.
26. In complicated fractures, there may be signs and symptoms of internal hemorrhage, open wounds in the chest cavity allowing the passage of air from the outside directly to the lungs or into the pleural cavity between the lungs and the chest wall.
27. All questionable injuries to the back, even in the absence of signs of paralysis, should be treated as for fracture of the spine.
28. In the event of a possible fracture of the neck, and the victim is found lying face down or on his side, turn him on his back, using extreme care to keep the head on a line with his back and to prevent any movement of the neck whatsoever.
29. If a patient suffers a suspected broken back and is found on his abdomen, place him on the splint face down.
30. If the victim is found lying on his side, extend his arms above his head and very carefully straighten his body before attempting to turn him.
31. If the victim is found on his back, no attempt should be made to turn him on his abdomen.
32. No extra padding should be placed on the splint under the shoulder area.
33. When the patient is found, and it is suspected that he has a broken neck or back, raise him carefully with enough support to prevent any movement of the back or neck, and only high enough to push a prepared and tested stretcher under him.
34. Tie all bandages around the body on the same side.
35. Frequently rupture of the bladder results from a fracture of the pelvis or hip.
36. Cover the patient with a blanket, treat for shock, and get him to a doctor or hospital at once, as an operation for rupture of the bladder offers hope for success only in the first hour or two.
37. In first aid, no attempt should be made to reduce dislocations, except dislocations of the lower jaw, fingers, and toes.
38. Where medical aid is readily available, do not attempt reduction of even these dislocations.
39. To treat a dislocated finger or toe, grasp the finger or toe just above the dislocated joint with one hand and just below the joint with the other hand, so that the extension is made only at the dislocated joint.
40. If the patient is unconscious, tie the forearms folded across the chest.

I. Handling and transportation of the injured
   1. It is the responsibility of the first-aid man to see that the patient is transported in such a manner as to prevent further injury and is subjected to no unnecessary pain or discomfort.
   2. Never move a patient until a thorough examination has been made and all injuries are protected by proper dressings.
   3. Various carries can be used in emergencies, but the stretcher is the preferred transportation method.
   4. Carrying in the arms, carrying astride the back, and the two-man carry should be used only when it is positively known that no injury will be aggravated by such handling of the patient.
   5. The three-man lift and carry is used where an injured person is to be carried a short distance, where he must be transported through narrow passageways, or where a stretcher is not available.
   6. Among the injuries for which a splint stretcher can be used are dislocated hip, dislocated knee, fracture of neck, fracture of back, fracture of pelvis, and all fractures of the lower extremities.
   7. In some instances where a patient is to be transported by stretcher, it is advisable to fold his arms across his chest and tie them together, or, when it is necessary, the feet may also be tied together during transportation.
   8. When the three-man lift is used for placing an injured person onto a stretcher, the injured person is only raised and supported on the knees of the three lifting men and then placed on the stretcher.
   9. In injuries to the neck, back, pelvis, or hip, the patient is lifted just high enough to slide the body splint or splint stretcher under him and not to the knees of the kneeling men.
   10. The patient is carried on the stretcher feet first, the end nearest his feet being the front end, and the end nearest his head being the rear.
   11. The front and two side carriers step off on the left foot, whereas the rear carrier starts off with his right foot.
   12. For carrying a patient underground, each of the four (4) stretcher bearers should take hold of a handle of the stretcher.

I. Dressings
  A. Definition
    1. Dressing is the immediate protective cover placed over a burn or wound.
  B. Improvised dressings
    1. Linen. Handkerchief, towel, sheet, pillowcase, or napkin.
    2. Never use fluff cotton over an open wound because the fibers are difficult to remove.
  C. Functions
    1. To assist in the control of bleeding
    2. To absorb blood and wound secretions
    3. To prevent contamination and infection
    4. To ease pain
  D. Sterilization
    1. Boil for 15 minutes or press with a hot iron.
  E. Application
    1. Dressing should be large enough to extend one (1) inch or more beyond the edge of the wound. Hold the dressing directly over the wound and lower it into place. If secured with tape, do not wrap completely around affected part because blood vessels may be constricted as swelling occurs.

II. Bandages
  A. Definition
    1. Bandage is a strip of material used to hold a burn or wound dressing or splint in place.
  B. Improvised
    1. Linen or unbleached muslin. Emergency bandages can be devised from handkerchiefs, belts, ties, socks, etc.. Bandage must be clean but need not be sterile.
  C. Kinds
    1. Gauze bandages, usually in rolls of 10 yards 1, 2, or 3 inches wide.
    2. Triangular bandages
    3. Binder bandages
      a) May be devised from a large towel or sheet. Used as a bandage or dressing to cover a large area of the chest or abdomen.

III. Combination dressing and bandage
  A. Sterile bandage compress
  B. Adhesive strips with an attached gauze dressing

IV. Application of bandages
  A. General principles
    1. A bandage should be snug, but not so tight as to interfer with circulation.
    2. When a bandage or splint is applied to the arm or leg, leave the fingers or toes exposed.
    3. Loosen, if patient complains of numbness or tingling.
    4. Never apply a wet gauze bandage, because it will shrink as it dries and become too tight.
    5. Triangular bandage can be folded into a cravat bandage, which in turn, can be used as a tie for a splint, constricting bandage, or as a tourniquet. Also, a cravat bandage can be folded several times to form a thick pad or placed over another dressing.

FIRST AID INSTRUCTIONS

Compliments of Kentucky Department of Mines and Minerals

ASPHYXIATION

SYMPTOMS: Unconscious. Lips, ear lobes blue, breathing stopped.

TREATMENT: Get victim to fresh air. Start artificial respiration.

ALCOHOLIC POISONING

SYMPTOMS: Unconscious, partial or complete. Face flushed, or bloated.

TREATMENT: Give emetic, apply heat, rub extremities.

ARTERIAL BLEEDING

SYMPTOMS: Bright red blood spurting from wound.

TREATMENT: Apply tourniquet at nearest pressure point. Release every 10 minutes.

BLEEDING---VEINOUS

SYMPTOMS: Dark red blood flowing steadily.

TREATMENT: Apply sterile compress firmly over wound. Do not break blood clot.

BLEEDING---INTERNAL

SYMPTOMS: Faintness, pale face, thirst, sighing, weak, rapid pulse.

TREATMENT: Lower head, apply cold packs to point you think bleeding.

BURNS

SYMPTOMS: Caused by application of heat, dry or moist, chemicals, acids or alkalies.

TREATMENT: Cover with Burn Treatment to exclude air.
Chemical Burns---Neutralize by flushing with water. Treat as above.

DROWNING

SYMPTOMS: Unconscious, not breathing.

TREATMENT: Remove water. Clean Mouth, tongue forward. Loosen clothing. Give artificial respiration.

DISLOCATIONS:

SYMPTOMS: Compare injured to uninjured limb, longer or shorter.

TREATMENT: Dress along lines of deformity. Do not attempt to reduce.

ELECTRIC SHOCK

SYMPTOMS: Unconscious. Breathing stopped, burn at point of contact.

TREATMENT: Insulate self, Rescue Victim. Start artificial respiration. Treat burns.

FAINTING

SYMPTOMS: Face pale. Eyelids droop. Cold sweat. Pulse weak and rapid.

TREATMENT: Lower head, keep warm. Give stimulants.

FRACTURES---SIMPLE

SYMPTOMS: Pain, swelling. Unable to move part below.

TREATMENT: Support limb above and below fracture. Apply well-padded splints.

XIII. First aid equipment
  A. Locations
    1. New mine
      a) When a new mine is being opened, the necessary first aid equipment and supplies must be maintained on the surface; at the mine dispatcher's office or in close proximity to the mine entry.
    2. Bottom of slope or shaft
      a) At the bottom of each regularly traveled shaft or slope, when the bottom of such shaft or slope is not more than 1,000 feet from the surface.
    3. Working section
      a) At a point in each working section not more than 500 feet out by the active working face or faces.
  B. Training
    1. Inexperienced Miners
      a) To transport injured workers to the surface, the training requirements are that all inexperienced miners have initial training in first aid methods and that all certified employees will receive five (5) hours of first aid retraining annually.
  C. Requirements
    1. First aid equipment and supplies shall be stored in a suitable dust-tight, moisture-proof containers and such supplies shall be accessible to the miners.
    2. Equipment and supplies
      a) One (1) stretcher
      b) One (1) broken-back board
      c) Twenty-four (24) triangular bandages (fifteen (15) if a splint-stretcher combination is used).
      d) Eight (8) 4-inch bandage compresses
      e) Eight (8) 2-inch bandage compresses
      f) Twelve (12) 1-inch adhesive bandages
      g) One (1) foille (burn ointment)
      h) Two (2) cloth blankets
      i) One (1) rubber blanket, or equivalent substitute
      j) Two (2) tourniquets
      k) One (1) 1-oz. bottle aromatic spirits of ammonia, or one (1) dozen ammonia ampules
      l) Two (2) inflatable plastic arm splints, or the necessary compliments of arm and leg splints
      m) Two (2) inflatable plastic leg splints

GLOSSARY OF TERMS

Abrasion. Wound caused by skin being scraped off.

Artery. Blood vessel that carries blood away from the heart to other parts of the body.

Avulsion. A tearing away of a part of the body.

Capillary. One of the minute blood vessels between the ends of the arteries and the beginnings of the veins.

Coagulation. Formation of a semisolid mass from a liquid, such as blood or lymph. Clotting.

Diaphragm. The septum, or wall, between the chest and the abdomen.

Dislocation. The separation of the parts of a joint.

Epiglottis. The flap over the larynx which closes during swallowing to prevent food from entering the windpipe.

Esophagus. The tube which carries food from the mouth to the stomach.

Fracture. A break in a bone.

Hernia. Rupture; abnormal condition in which part of an organ pushed through the wall around it.

Incision. Wound produced by a sharp cutting edge, such as a knife, a piece of glass, or metal.

Laceration. Wound caused by cutting or tearing of tissue.

Puncture. Wound caused by a pointed object.

Respiration. The act of breathing; the taking in of oxygen and throwing off of carbon dioxide by any part of the body.

Resuscitation. Revival of one apparently dead. (In this case, revival of a victim who is unconscious and not breathing using methods of artificial respiration.)

Sprain. Wrenching of a joint, producing stretching or tearing of ligaments or tendons.

Strain. An injury from overuse or misuse which caused unusual tension in a muscle.

Suffocation. Death from lack of oxygen.

Vein. A blood vessel which carries blood to the heart from other parts of the body.

PART IX

ELECTRICAL HAZARDS, MOVING EQUIPMENT

XIV. Electricity
  A. Concept
    1. Types of electricity
      a) Alternating current (AC)
        1. Components of an alternating current (AC)
          a) Power source (normally, furnished by a utility company)
          b) Load (uses the electricity)
          c) Wire (carries the electricity)
        2. Advantages and disadvantages
          a) AC current can be transmitted greater distances at a lesser power loss than DC currents.
          b) AC current does not require as large a conductor as the same amount of DC voltage; therefore, AC feeder circuits are cheaper.
          c) AC current is not as adaptable as DC current on track-haulage equipment (motors and mantrips) where variable control (accelerating, decelerating, braking, and reversing) of the motor is required.
      b) Direct current (DC)
        1. Components of a direct current (DC)
          a) Power source (usually, a battery, generator, or a rectifier)
          b) Load (uses the electricity)
          c) Wire (carries the electricity)
        2. Advantages and disadvantages
          a) DC current is adaptable for machines that require varible control.
          b) DC current cannot be transmitted long distances without power loss.
          c) DC current requires a larger conductor for the same amount of AC voltage; therefore, DC feeder circuits are more expensive than AC feeder circuits.
  B. Primary Hazards
    1. Electrical arcs
    2. Electrical heat
    3. Electrocution
    4. Explosions
  C. Potential Dangers
    1. Broken cables, partially broken cables, damaged insulation, and spiced cables.
    2. Bare electrical conductors
    3. Untagged switches or circuit breakers
    4. Underground or poorly grounded electrical installations or electrical circuits.
  D. Trolley wires (DC)
    1. Guarded locations
      a) At all points where miners are required to work or pass regularly under the wires.
      b) On both sides of all doors and stoppings.
      c) At mantrip stations.
    2. Cut-off switches.
      a) At least every 2,000 feet on all main haulageways, and
      b) At all branch lines.

3. Precautions
   a) You should get into and out of mantrips on the side opposite the trolley wire.
   b) Never ride a mantrip on the trolley wire side.
   c) You should not look directly at the contact on the trolley pole when you put the pole on the wire.
   d) You should unload supplies on the side that is opposite the trolley wire.
   e) You should never carry tools or supplies on your shoulder when you are near the trolley wire.
   f) You should walk on the side opposite the trolley wire (clearance side) when walking along track-haulage ways.

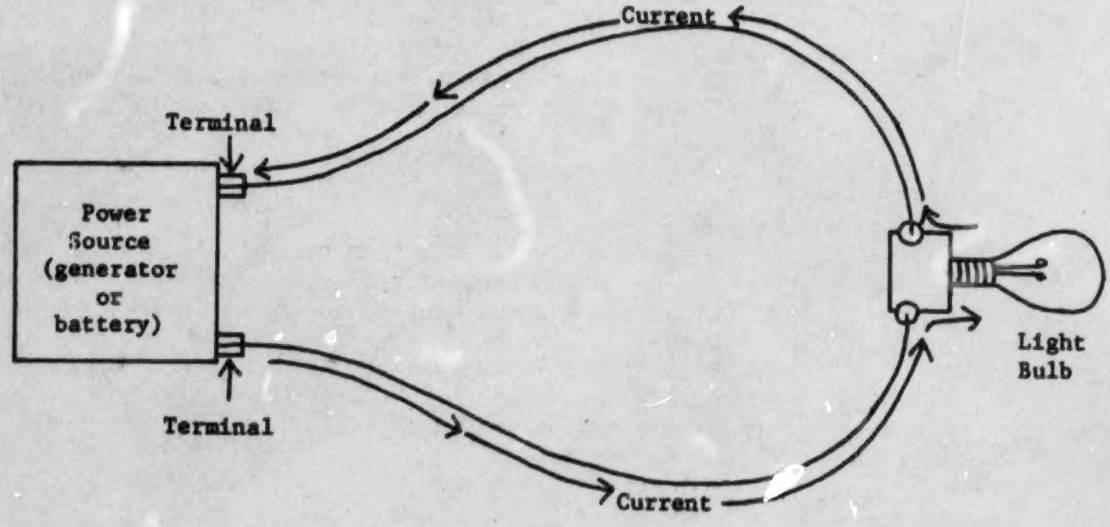
E. Feeder circuit (DC)
   1. Purpose
      a) To conduct the primary electrical current into the mine.
   2. Components
      a) A conductor or group of conductors and related electrical equipment that is part of the permanent (primary) mine wiring.
      b) Switches to turn power on and off.
      c) Fuses or circuit breakers to protect the circuit.

F. Feeder circuit (AC)
   1. Purpose
      a) To conduct the primary electrical current into the mine.
   2. Components
      a) A large, heavily insulated, and well grounded power cable.
      b) Distribution box
         1. Components
            a) Transformers (step down or step up the voltage)
            b) Switches (turn power on or off)
            c) Circuit breakers (Protect the circuit from over-heat or over-load)
            d) Receptacle plug-in (plug box)

G. Trailing cables
   1. Purpose
      a) To carry electricity from the trolley feeder circuit or distribution box to a machine.
   2. Splices
      a) Temporary
         1. Requirements
            a) Temporary splices must be as electrically and mechanically strong as the original cable.
            b) May only be used for the next twenty-four (24) operating hours.
            c) No temporary splice shall be made in a trailing cable within twenty-five (25) feet of the machine, except cable reel equipment.
      b) Permanent
         1. Requirements
            a) Mechanically strong with adequate electrical conductivity and flexibility.
            b) Effectively insulated and sealed so as to exclude moisture; and
            c) Vulcanized or otherwise treated with suitable materials to provide flame-resistant qualities and good bonding to the outer jacket.

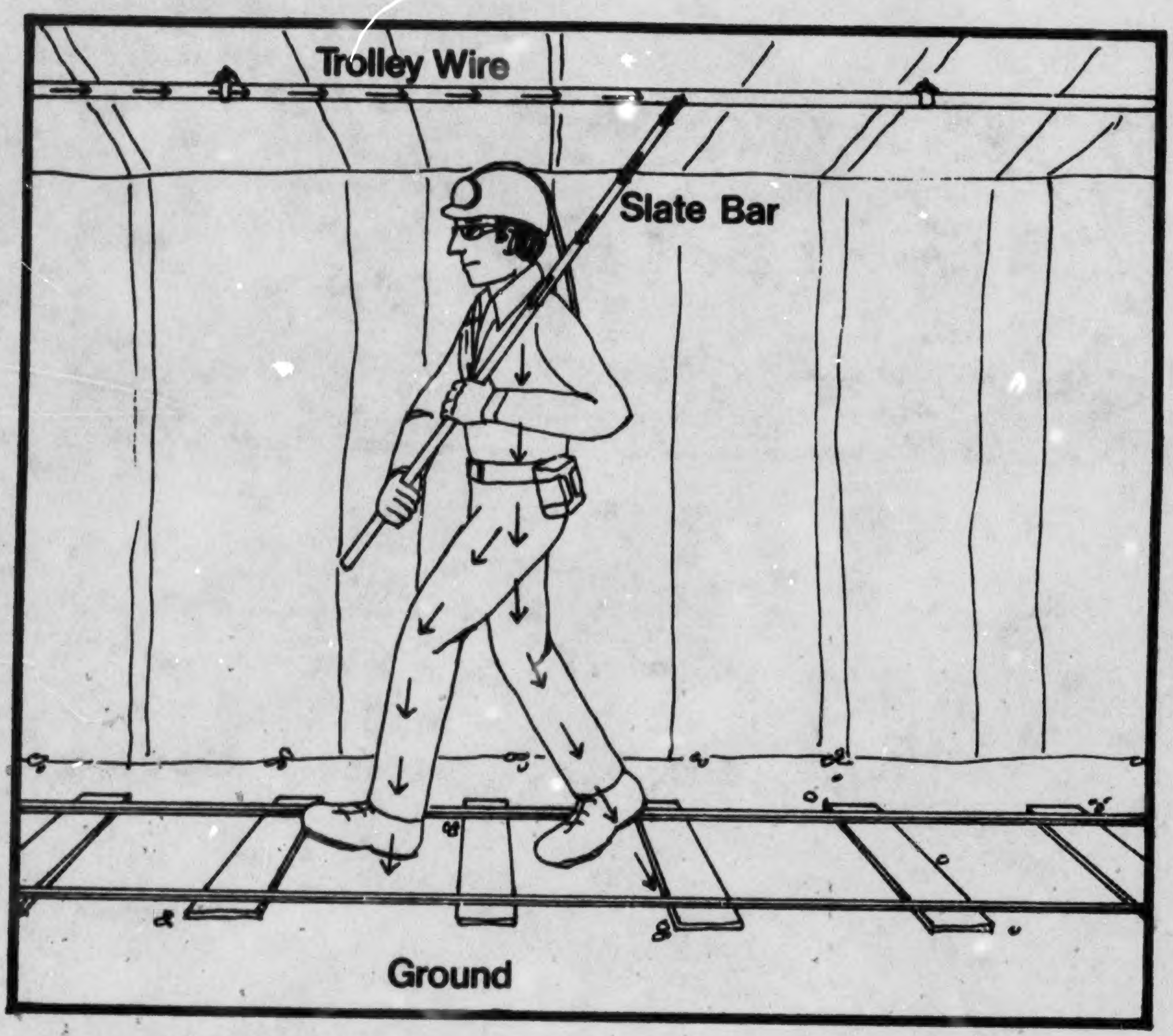
- H. Safety
    - 1. Personal protective safety equipment
        - a) Rubber boots
        - b) Rubber insulated gloves
    - 2. Rubber mats
        - a) Location requirements
            - 1. Power centers, and
            - 2. Switches
- I. Electrical contact
    - 1. Removal
        - a) Methods
            - 1. Cut the power (switch, breaker, nips, or a plug)
            - 2. Insulation to protect yourself from possible electricution (dry boards, rubber mat, heavy jacket, or any other insulation)
    - 2. First aid
        - a) Treatment
            - 1. Administer artificial respiration (in cases of electrocution, the victim's jaws may be clenched tight; if so, the mouth-to-nose method must be used)
            - 2. Treat for physical shock
            - 3. Care for possible burns, and
            - 4. Secure medical aid at once

CIRCUIT


Current
Terminal
Power Source (generator or battery)
Terminal
Light Bulb
Current

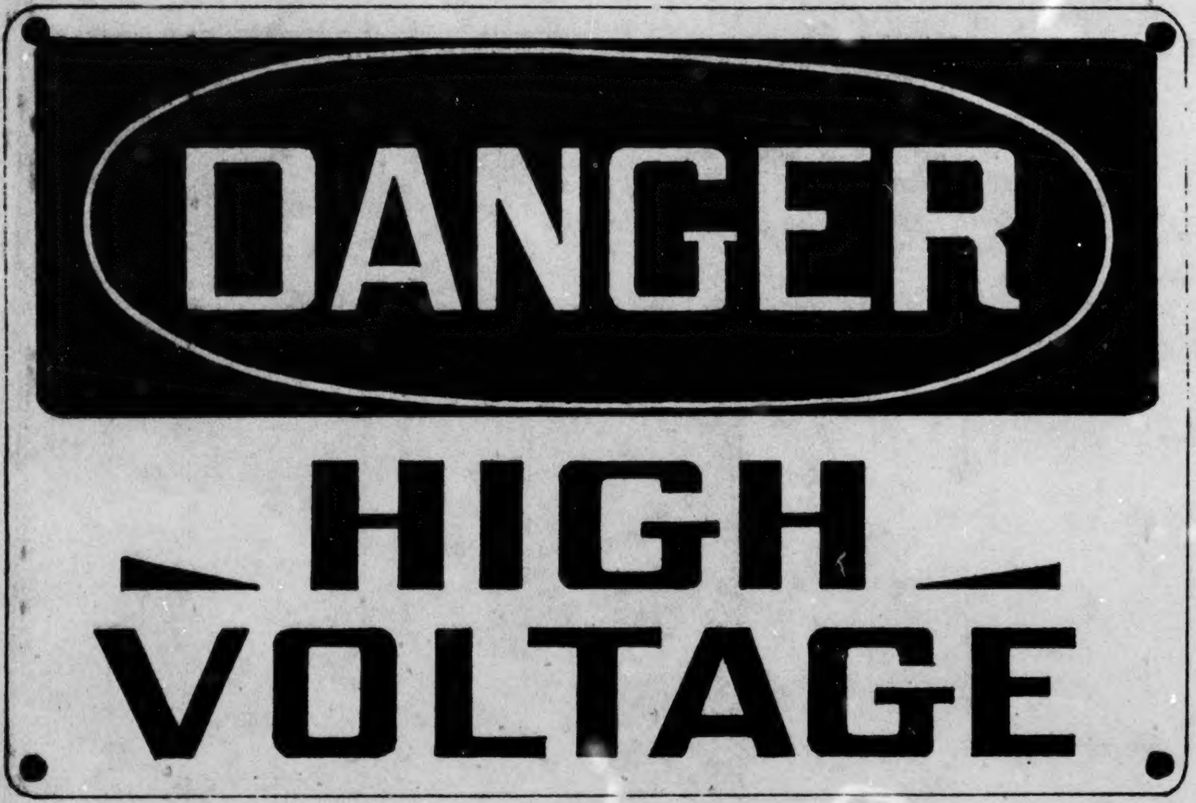
(Note: Pictured is DC current flowing in one direction. AC current flows alternately in both directions.)

THE BODY AS PART OF A CIRCUIT


Trolley Wire
Slate Bar
Ground

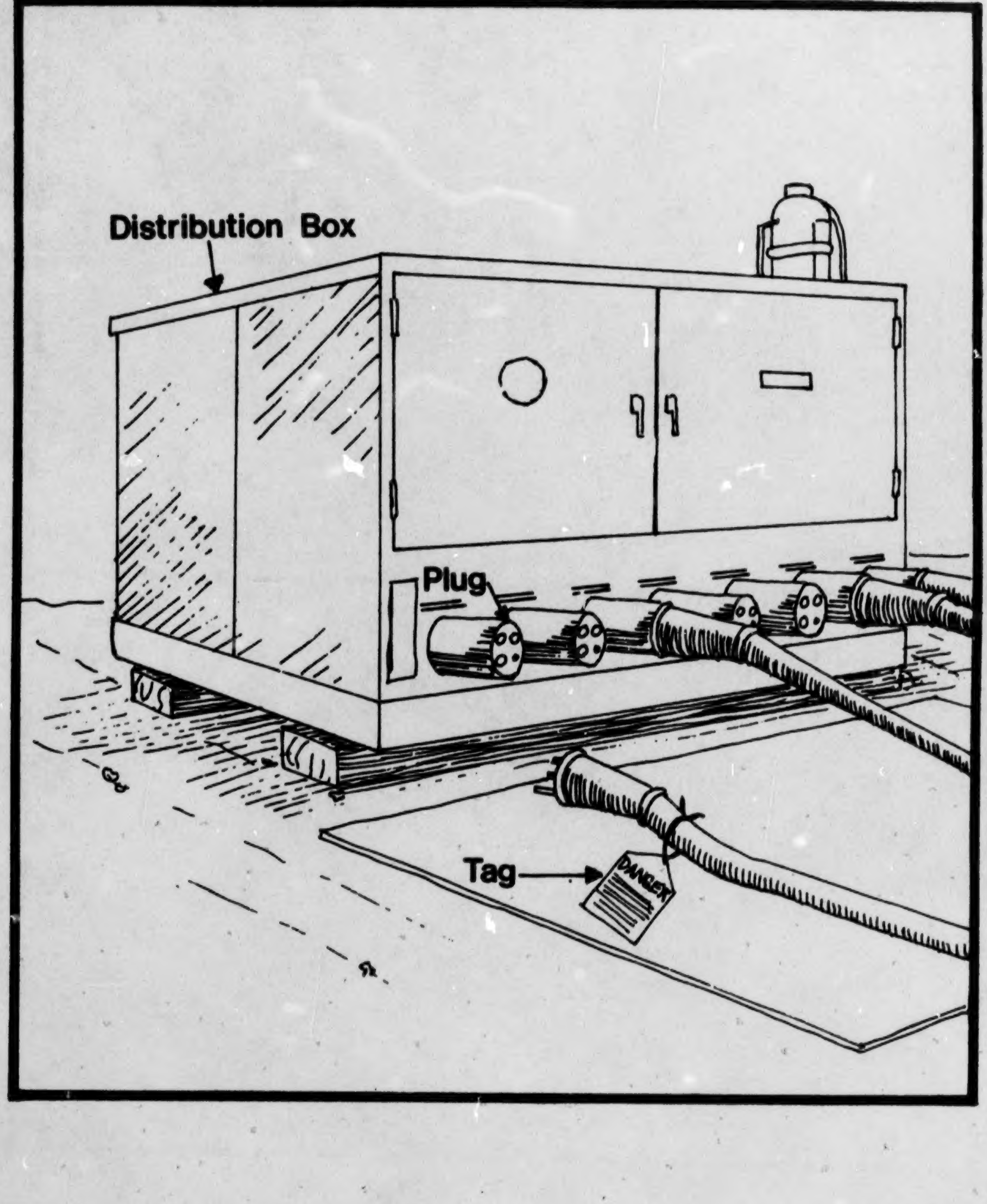
Current ↓

HIGH VOLTAGE SIGN

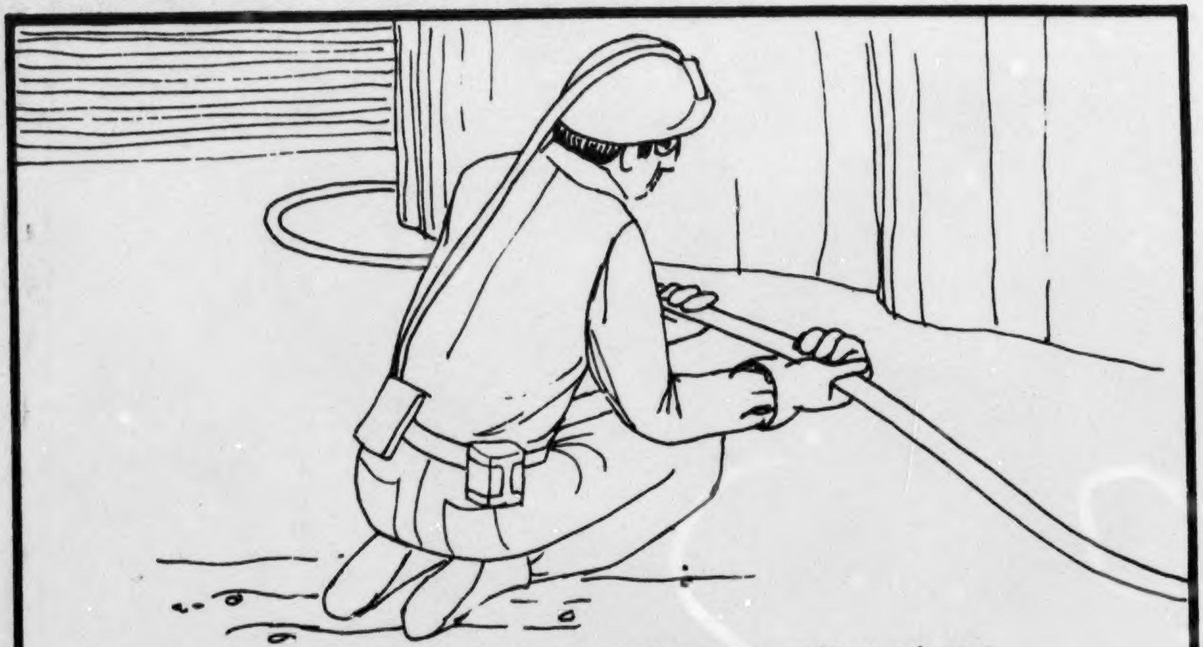

DANGER
HIGH
VOLTAGE

Stay away from any equipment marked by this sign.

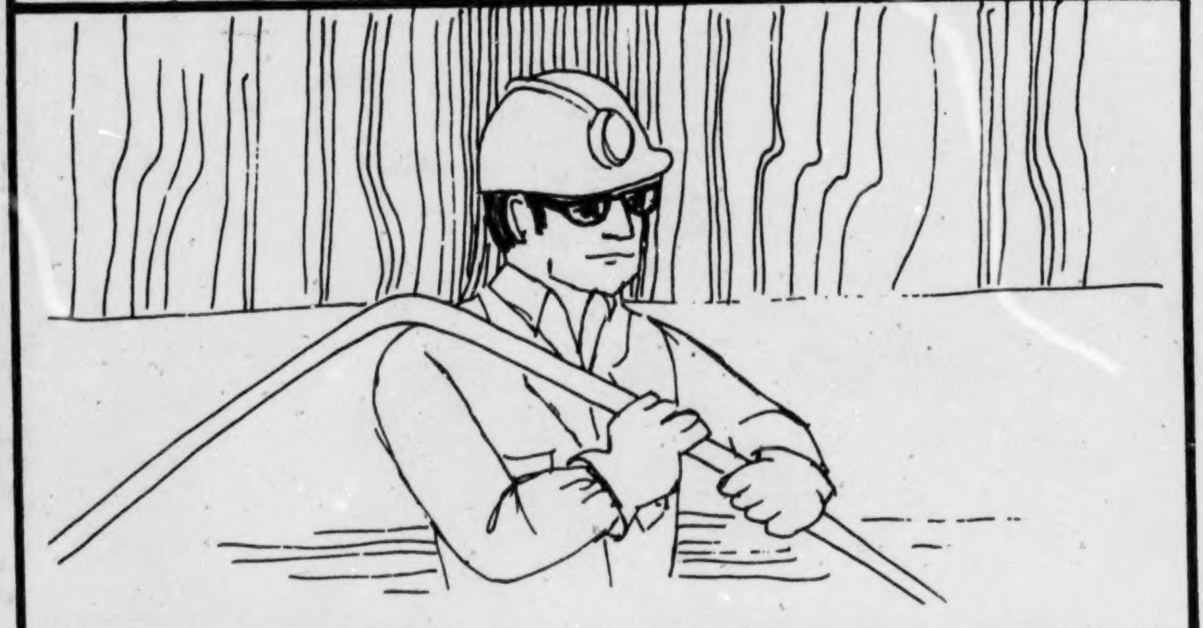
TAGGING OUT


Distribution Box
Plug
Tag
DANGER

HANDLING TRAILING CABLES

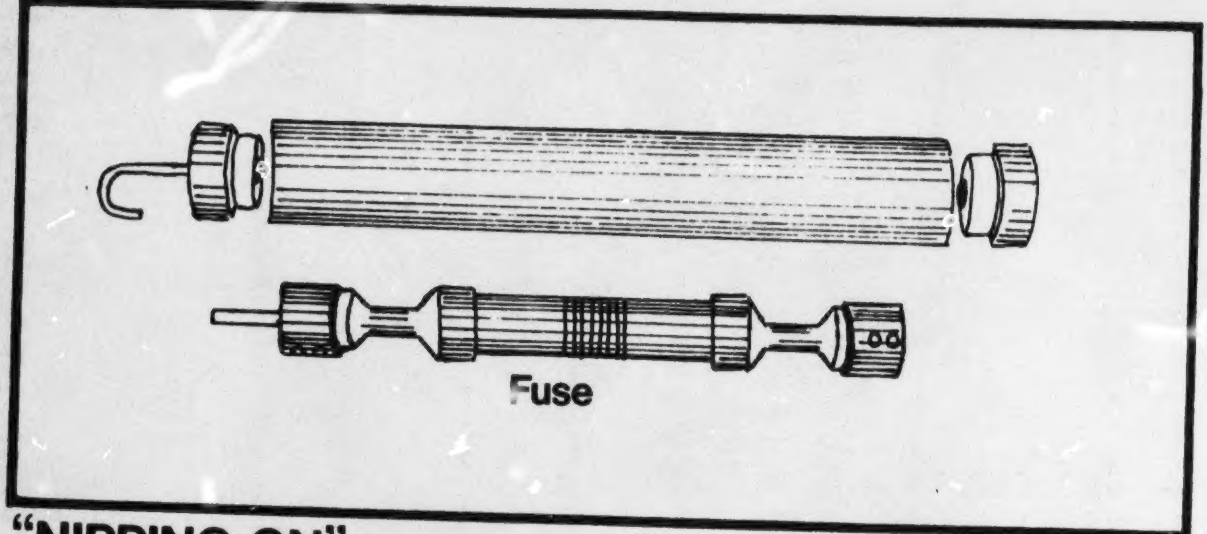


Never pick up a cable without wearing proper protective equipment, rubber gloves with protectors and Insulated shoes or rubber boots.

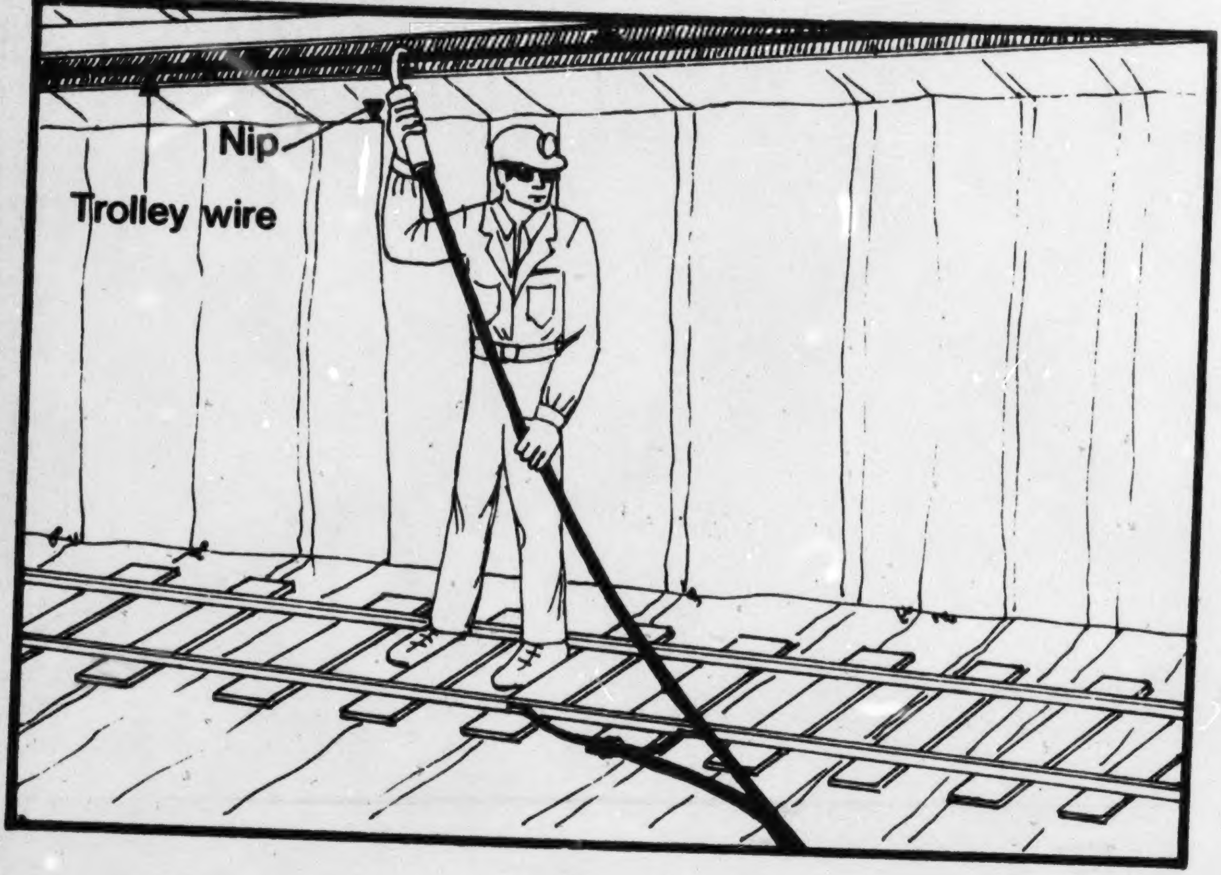


Do not place an energized cable over the shoulder.

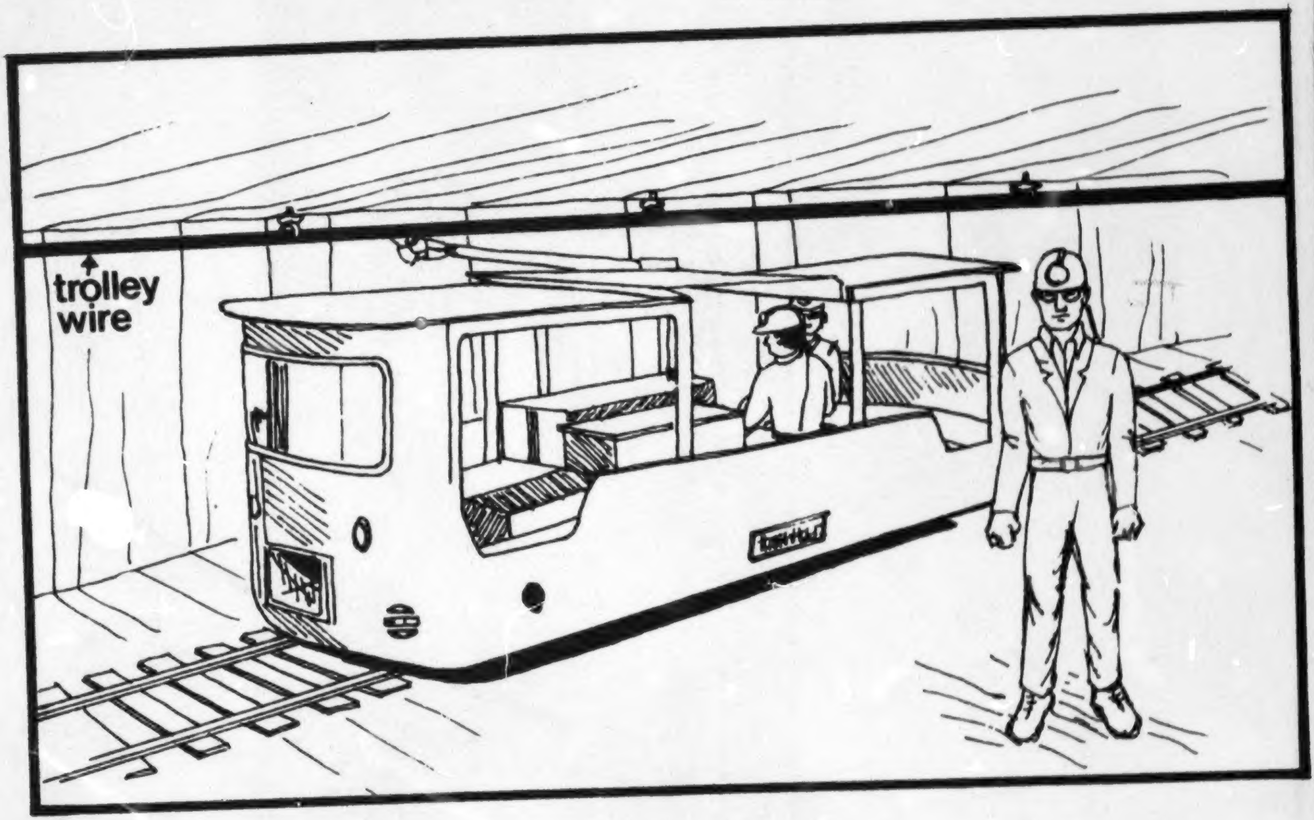
NIP



"NIPPING ON"

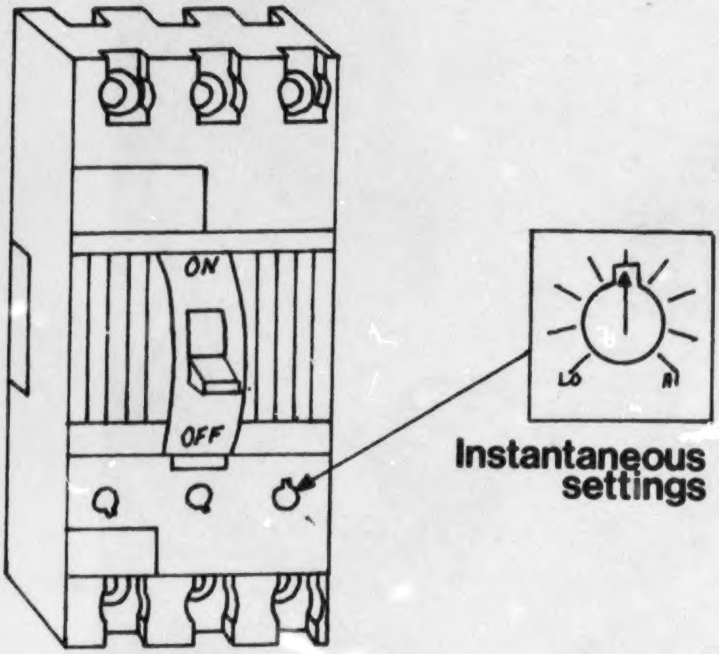

Nip
Trolley wire

TROLLEY WIRE


trolley wire

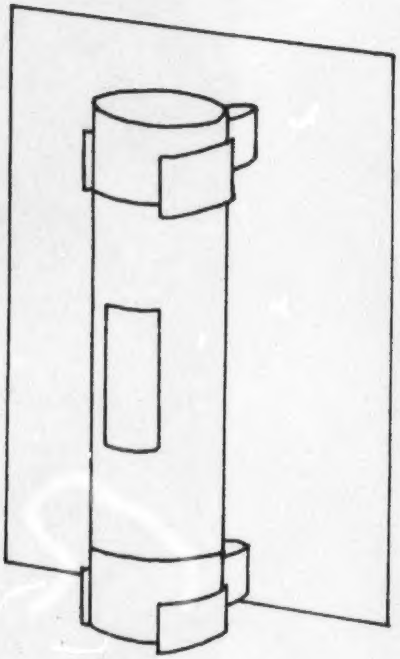
CIRCUIT BREAKER AND FUSE

CIRCUIT BREAKER

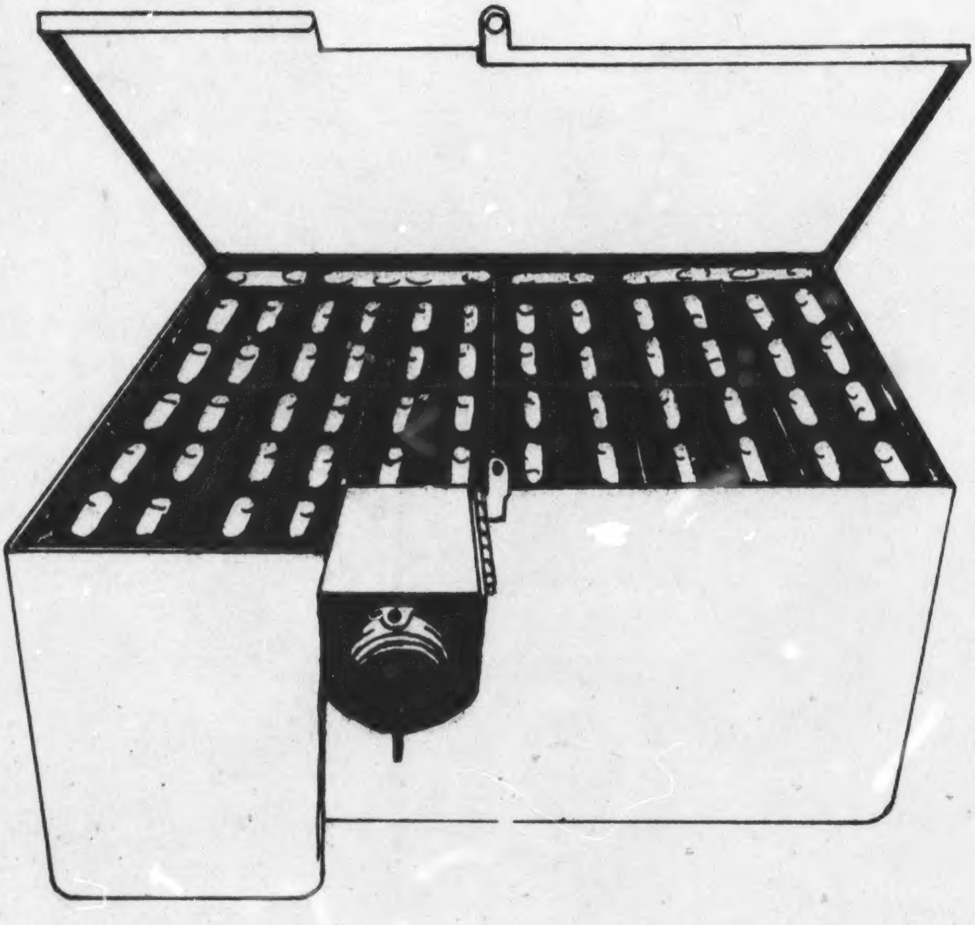


Instantaneous settings

FUSE



BATTERY



GLOSSARY OF TERMS

Arc. Intense light and heat created when an electric circuit is opened.

Battery. Source of DC electricity created from a chemical reaction.

Cable. Copper or aluminum wires contained in an outer jacket of two insulated layers used to conduct power under abnormal conditions.

Circuit breaker. Device used to manually disconnect power from a circuit or automatically disconnect power under abnormal conditions.

Conductor. Copper or aluminum wires that carry electric current to electric equipment.

Current. Movement of small particles (electrons) through electric conductors measured in amperes.

De-energize. To disconnect an electrical circuit from its source of power.

Electrocution. Death from an electric current flowing through the body.

Energized. A circuit that has electric power connected to it.

Ground wire or frame ground wire. A wire, connected to the metal frames of electric equipment on one end and the earth on the other, used to prevent electric shock.

Insulation. Non-conducting material such as rubber or plastic used to cover electric conductors.

Qualified electrician. An electrician, who through training and experience, has shown that he can perform electrical work safely and efficiently.

Resistance. Opposition to electric current flow.

Shock (electrical). Sensation caused by an electric current flowing through the body.

Splice. Mechanical joining of conductors that have been separated.

Switch. Device that is used to disconnect power from an electric circuit.

Sulfuric acid. Solution used in batteries to create electric power, which can severely burn human tissues.

Trailing cable. Cable used to conduct power to mobile mining machines.

Trolley wire. Bare copper conductor supported from the mine roof that supplies DC power to electric locomotives.

Trolley feeder wire. Bare copper or aluminum conductor paralleling the trolley wire that supplies DC power.

Ventribular fibrallation. A condition in which the heart ceases its normal pumping action and instead, feebly quivers.

Voltage. Electrical pressure that forces a current to flow, measured in volts.

J. Important things to remember

1. AC and DC electrical circuits have one important thing in common: if misused or handled improperly, they can injure or kill.
2. Since continuous miners consume large amounts of power, they are normally operated on AC.
3. Water can be electrically dangerous because it can help you make better contact with an electrical circuit and a ground.
4. An electrical current will take the easiest path (path of least resistance) to a ground.
5. The best way to prevent getting shocked is to ground all electrical equipment properly.
6. Another way to prevent getting shocked is to wear personal protective insulated equipment.
7. Always be sure you are using nips for the correct machine by reading the tags carefully or by tracing the cables.
8. Never put on nips that have been "tagged out."
9. When a plug is removed for machinery repairs, it should be tagged.
10. You should not look directly at the contact on the trolley pole when you put the pole on the wire.
11. You should never carry tools or supplies on your shoulder when you are near the trolley wire.
12. The most important thing for an inexperienced miner to remember is to leave power centers alone and stay away from them unless he is under supervision of a qualified person.
13. You should not throw tagged switches or circuit breakers unless you are under the supervision of a qualified person.
14. One common way that cables are damaged is by being run over by mobile equipment.
15. Every shuttle car trailing cable is anchored in one place because shuttle cars have automatic take-up reels for the cable.
16. If you notice bad insulation on a trailing cable, you should notify your boss and other workers.
17. A splice is more likely to be bad than unrepaired areas of a cable.
18. Before moving a person from electrical contact, you should cut the power, if possible.
19. After you remove the person from electrical contact, you should remove the victim to a safe place and administer first aid.
20. Always wear personal insulated protective equipment when handling cables.

PART X

PREVENTION OF ACCIDENTS

XV. Accidents
- A. Responsibility
  - 1. The fact is that no one individual or group, such as a committee, is responsible alone; but every single person has a part to play in general safety of the mine.
- B. Attitude
  - 1. The miner must be fully aware that his/her safety as well as the safety of other miners is at stake.
  - 2. Also, miners must be convinced that each worker has the opportunity to prevent accidental injuries by the actions he/she takes or does not take during daily activities.
- C. Causes
  - 1. Survey
    - a) Seventy-five (75) percent of the causes of underground coal mine accidents may be listed under carelessness or misjudgement.
    - b) Some accidents are unavoidable.
- D. Prevention
  - 1. Using tools or equipment safely.
  - 2. Operating or using equipment only when authorized.
  - 3. Securing equipment and supplies against unexpected movement.
  - 4. Warning or signaling, as required.
  - 5. Making sure safety devices are operative.
  - 6. Avoiding use of defective tools or equipment.
  - 7. Working at a safe speed.
  - 8. Taking a safe position or posture.
  - 9. Not riding hazardous, moving equipment.
  - 10. Not servicing moving, energized or otherwise hazardous equipment.
  - 11. Avoiding horseplay, such as distracting, startling or teasing others.
  - 12. Wearing personal protective equipment.

XVI. Lifting procedures in high coal
  A. Basic Steps
    1. Keep feet apart, one alongside and one behind the object. Do not reach out.
    2. Keep back straight, nearly vertical.
    3. Tuck chin in.
    4. Grip the object with the whole hand.
    5. Tuck elbows and arms in near body.
    6. Keep body weight directly over feet.
  B. Other considerations
    1. Stand close to the load to be lifted instead of reaching out.
    2. Lift with the leg and arm muscles instead of with back as much as possible.
    3. Always carry the load close to the body.
    4. If the load is too heavy or interfers with normal walking, get help.
    5. When changing directions while carrying a load, turn entire body, including feet, and do not turn suddenly.

XVII. Lifting procedures in low coal

A. Basic steps

1. Get a person to help, whenever possible.
2. Use mechanical aids, when available.
3. Keep knees parted, one alongside the object and one behind.
4. Keep your back straight.
5. Tuck the chin in so that the neck and head continue the straight line of the back.
6. Grip the object with the whole hand.
7. Tuck elbows and arms in near body.
8. Keep body weight over knees.
9. Lift with upper leg and arm muscles.
10. Shift knees when turning with a load--avoid twisting the back.
11. Do not make sudden turns while lifting.

XVIII. Carrying hand tools
   A. Methods
      1. Carry tools so that they are fairly balanced in your hand to give you full control of them.
      2. Carry tools so that they will not come in contact with a bare trolley wire or other electric power source.
      3. Anticipate what may happen in unique situations and develop ways to carry tools and actions to take to prevent accidents.

XIX. Proper handling of supplies and materials

A. Supplies and materials to be handled
   1. Rails
   2. Concrete blocks
   3. Headers
   4. Roof bolts
   5. Cribbing
   6. Tubing
   7. Crossbars
   8. Planks and timbers

B. Basic Steps
   1. Change direction, lift the object to carrying postion and turn the entire body including the feet. Do not twist the body.
   2. If the object is too heavy to be handled by one person, get help.
   3. To place an object on a supply vehicle or bench:
      a) Set the object on the edge.
      b) Push it far enough onto the support so that it will not fall; and
      c) Move it in place by pushing with the hands and body firmly in front of the object.
   4. To raise an object above shoulder height:
      a) First lift object to waist height.
      b) Rest object on a ledge, stand, or hip.
      c) Shift hand position so that object can be boosted after knees are bent, and
      d) Straighten knees as object is lifted or shifted to shoulder

C. Additional steps
   1. Wear gloves to prevent injuries from splinters, burrs, cracks, and sharp edges froom wooden and metal materials.
   2. Carry material so as to insure unobstructed vision.
   3. Store material where you can get at it easily, but where it will not block or obstruct passageways.
   4. Make sure everyone, and your own limbs, are in the clear before putting down or unloading supplies or materials.
   5. Do not overload trucks, cranes, or elevators.
   6. When operating underground supply cars, scoops, tractors, or any other motorized equipment, do not overload, secure load well, and drive at safe allowable speeds.

Yearly in the
United States

53 Million persons are injured

OF WHICH

40 Million are medically treated

EACH YEAR THERE ARE 100,000 ACCIDENTAL DEATHS

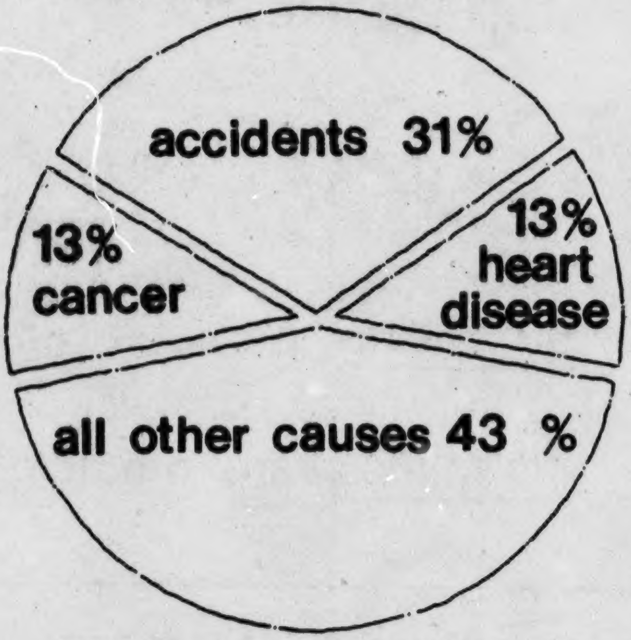
50,000 MOTOR VEHICLE RELATED

30,000 HOME RELATED

11,000 OCCUPATIONAL, NON-MOTOR VEHICLE

9,000 OTHER

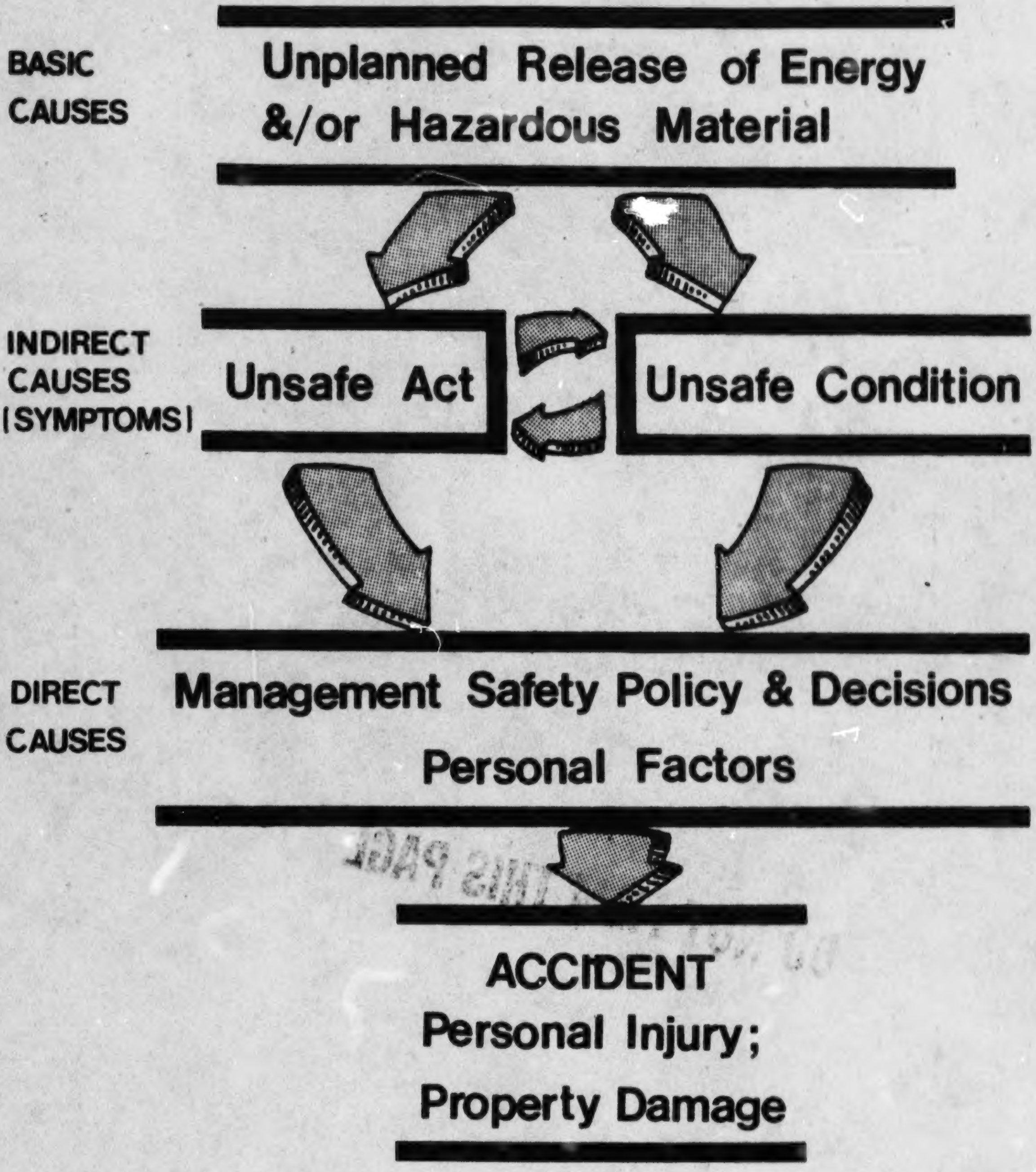
Accidents are the leading cause of death in the United States among younger workers



DEATHS & INJURIES CAUSED BY ACCIDENTS AMONG U.S. WORKERS IN 1975

ACCIDENT	AT WORK	AWAY FROM WORK	TOTAL
FATAL	12,000	37,000	50,400
DISABLING	2,200,000	3,200,000	5,400,000
NONDISABLING	7,100,000	9,600,000	16,700,000

Accident Causes



BASIC CAUSES

Unplanned Release of Energy &/or Hazardous Material

INDIRECT CAUSES (SYMPTOMS)

Unsafe Act

Unsafe Condition

DIRECT CAUSES

Management Safety Policy & Decisions

Personal Factors

ACCIDENT

Personal Injury;

Property Damage

U.S. Coal Mine Accidents 1977

	ALL MINERS		NEW MINERS ONLY LESS THAN 1 YEAR EXPERIENCE	
TOTAL NO. OF ACCIDENTS	16,875		4,038	
HANDLING OF MATERIALS	4,941	29 %	1,293	32 %
HAULAGE	2,565	15 %	519	13 %
MACHINERY	2,209	13 %	469	12 %
SLIPS AND FALLS	1,705	10 %	420	10 %
HAND TOOLS	1,521	9 %	374	9 %
FALL OF ROOF	1,420	8 %	332	8 %

GLOSSARY OF TERMS

Accident. Any unplanned event that results in personal injury and/or property damage.

Hazard. Any condition that may result in the occurence of, or contribution to, an accident.

Cage. Mining term for elevator.

Headpiece. A cap. (That is, a light and hat.)

Incidence Rate. Rate of injury occurrence based on the number of injuries per 200,000 man hours. This is computed as follows:

$$\text{IR} = \frac{\text{number of injury occurrences}}{\text{hours of exposure}} \times 200{,}000$$

Severity Measure. A measure of the severity of accidents based on the amount of time lost per 200,000 man hours. This is computed as follows:

$$\text{SM} = \frac{\text{sum of days}}{\text{hours of exposure}} \times 200{,}000$$

PART XI

EXPLOSIVES

- XX. Explosives and blasting
  - A. Type of explosive
    - 1. Any explosive used in an underground coal mine must be permissible, which means approved for use by the Mine Safety and Health Administration (MSHA).
  - B. Requirements
    - 1. Short flame-life
    - 2. Low flame-temperature
  - C. Conventional Mining cycle
    - 1. Undercutting/overcutting the face
    - 2. Drilling
    - 3. Shooting
    - 4. Loading and hauling
    - 5. Supporting the roof
  - D. Shot firer
    - 1. Requirements
      - a) All underground coal mines are required by law to employ only shot firers who are certified to handle and detonate explosives.
      - b) Also, the law requires that shot firers employed in underground coal mines must be qualified to make certain test and examinations for gas and other dangerous conditions.
      - c) The shot firer must make tests and examinations for gas and other dangerous conditions before and after each shot or multiple of shots.
  - E. Driller
    - 1. Responsibility
      - a) Driller must not drill holes for explosive charges beyond the depth of undercut/overcut.
  - F. Basic steps
    - 1. Test for methane and other dangerous conditions before charging drill holes.
    - 2. Measure depth of drill holes before charging drill hole.
    - 3. Wire explosive charges and insert charges in hole.
    - 4. Tamp the hole with non-combustible stemming.
    - 5. Unreel shooting cable from the charges to a safe place around a corner and out of the line of fire
    - 6. Check adjacent workings for danger of blown-threw shots.
    - 7. Verbally warn other workers of the imminent explosion by yelling out "fire" three (3) times.
    - 8. Check blasting circuit with an approved galvanometer.
    - 9. Connect the blasting cable to the terminals of the blasting device.
    - 10. Detonate the charge.
    - 11. Recover (retrieve) the blasting cable.
    - 12. Wait until smoke and dust have cleared before entering the blasted area.
    - 13. Crawl over the blasted coal and make tests and examinations for gas and other dangerous conditions.
  - G. Noncertified miners
    - 1. Tasks and duties
      - a) The law permits noncertified miners to handle and transport explosives to the working section.

H. Handling explosives
- 1. Procedures
  - a) Explosives shall be carried separately from firing devices (detonators).
  - b) If explosives and detonators are carried on the same trip, they must be separated by a four (4) inch partition made of hardwood or other suitable material.
  - c) Explosives must be carried in non-conducting containers.
  - d) Containers containing explosives shall be properly identified or marked.
  - e) Explosives or detonators shall be transported in special closed containers when:
    - 1) In cars moved by means of locomotive or rope.
    - 2) On belts.
    - 3) In shuttle cars, or
    - 4) In equipment especially designed to transport such explosives or detonators.
  - f) Explosives shall not be carried on a mantrip.
  - g) A trip carrying explosives must precede or follow a mantrip by at least five (5) minutes.
  - h) Explosives and detonators stored in working places shall be kept in separate closed containers which shall be located out of the line of blast and not less than fifty (50) feet from the working face and when stored shall be separated by a distance of at least five (5) feet.
  - i) Not more than a forty-eight (48) hour supply of explosives shall be stored underground in any one (1) working section.
  - j) A hand loader is permitted to carry the amount of explosives he/she may reasonably expect to use in any one (1) shift.
  - k) Explosives and detonators shall be stored at least fifteen (15) feet from pipe lines, rails, power lines, or conveyors.

I. Gases
- 1. Carbon monoxide and oxides of nitrogen are released when explosives are fired.

J. Misfires
- 1. If a shot misfires, wait five (5) minutes before returning to the face to examine the firing circuit.

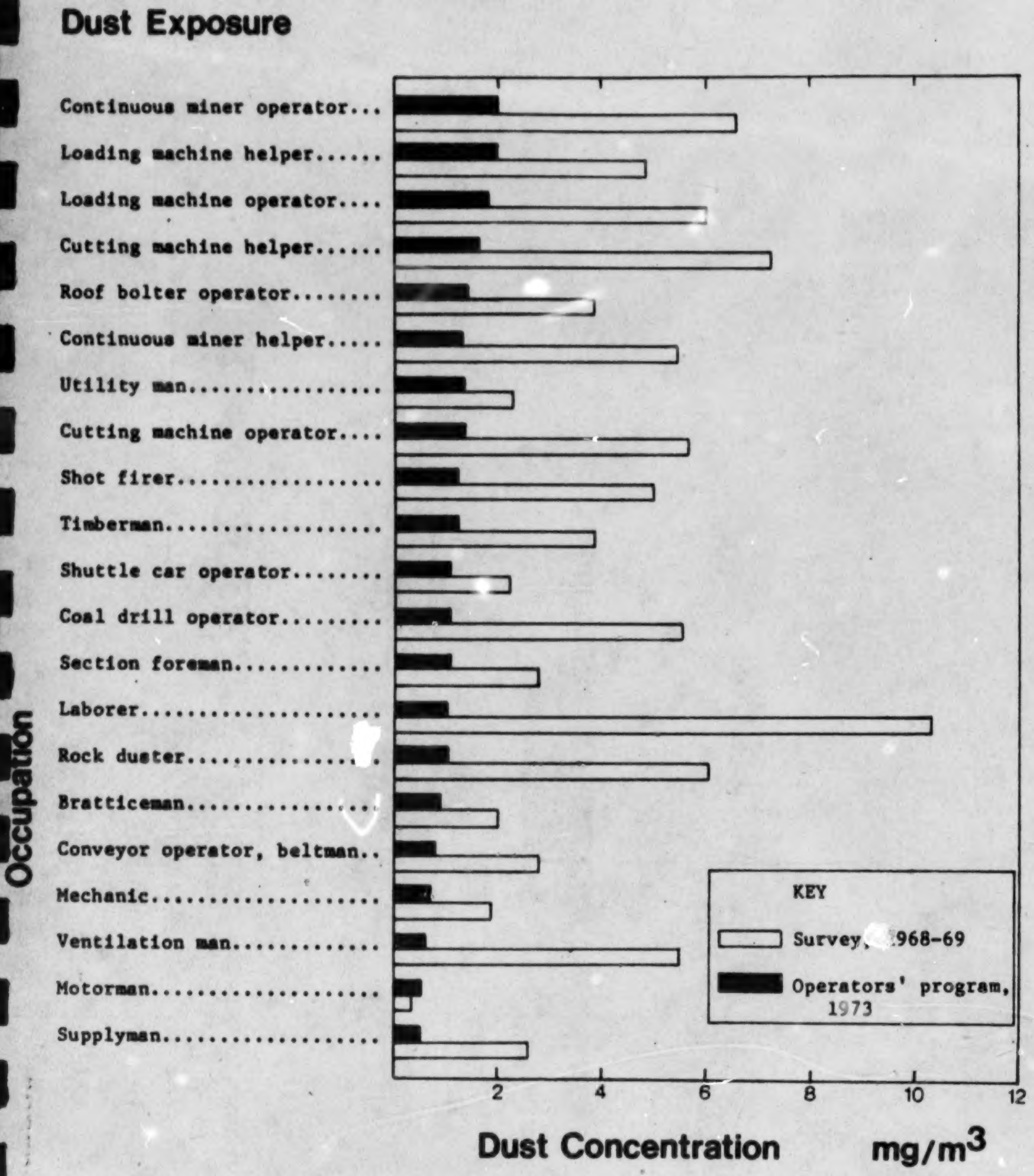
K. Work or other activities
- 1. Electrical equipment shall not be operated in the face areas and only work in connection with timbering and general safety shall be performed while boreholes are being charged.

PART XII

HEALTH AND SAFETY STANDARDS

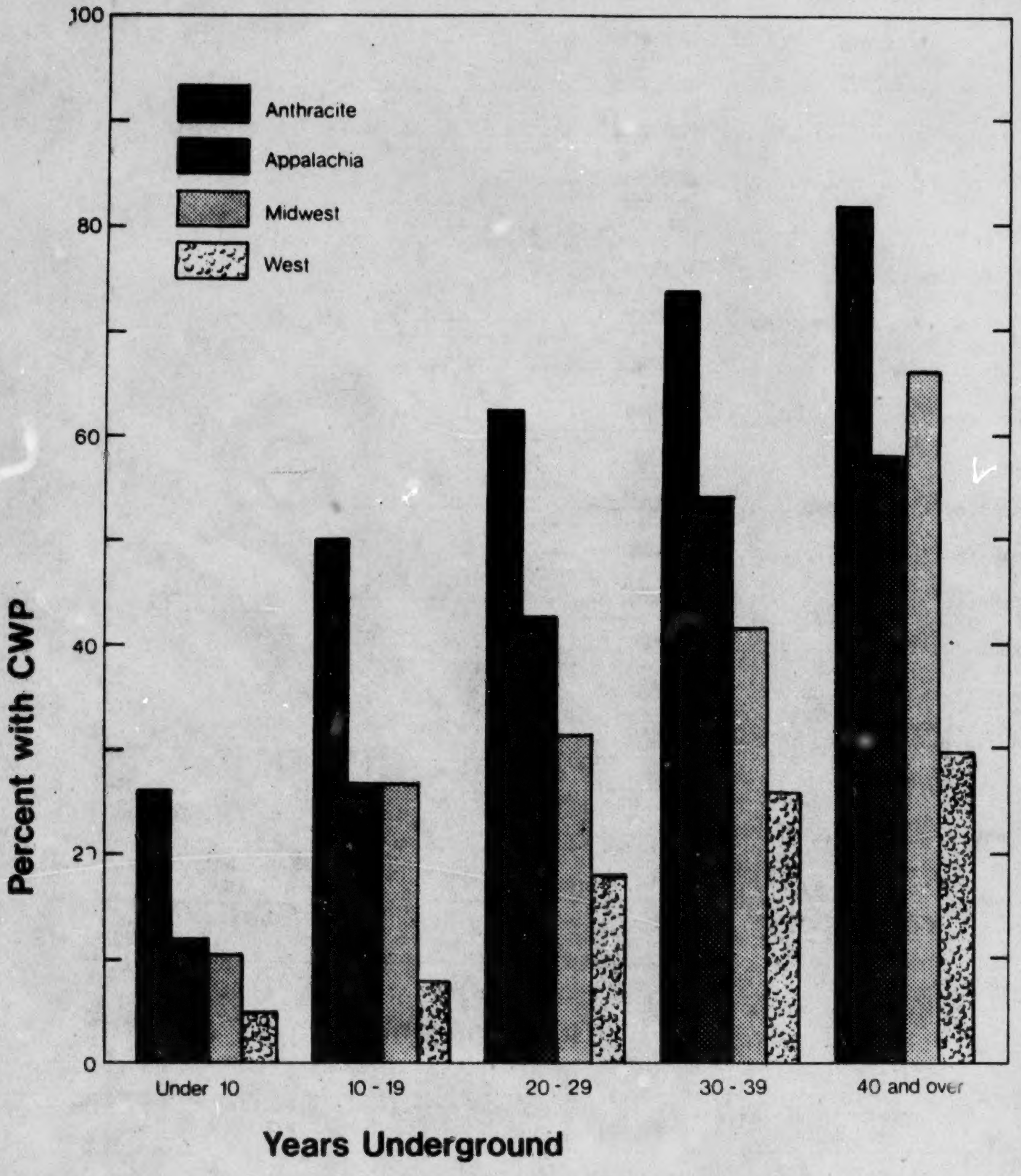
XXI. Health terms and protective devices
- A. Black lung
  - 1. Definition
    - a) Is a respiratory disease produced by the reaction of the lungs to fine particles of coal dust breathed into and retained in the small air sacs of the lungs.
  - 2. Associated diseases
    - a) Simple pneumoconiosis
    - b) Complicated pneumoconiosis
    - c) Emphysema
    - d) Chronic bronchitis
- B. Protective devices
  - 1. Respiratory
    - a) Respirator
      - 1. Definition
        - a) Is a device that is worn over both the nose and mouth of the miner to filter out both respirable and non-respirable particles of coal dust.
      - 2. Types
        - a) Disposable
        - b) Replaceable
      - 3. Use of a respirator
        - a) Cover both the nose and mouth with the respirator.
        - b) Check to see if the edge of the respirator is flat on your face.
        - c) If it becomes difficult to breathe, change the filter in the respirator or throw away the respirator if it is disposable.
  - 2. Sound (hearing)
    - a) Ear plugs
    - b) Ear muffs
      - 1. Ear muffs are more effective than ear plugs and do not have the problem of dirt accumulation.
    - c) Effects
      - 1. High-noise levels can affect your hearing, and
      - 2. Interefere with communication between you and your fellow workers.
    - d) Exposure
      - 1. Restrictions
        - a) The Federal Coal Mine Health and Safety Act of 1969 requires that you may not be exposed to sound levels greater than ninety (90) decibels for an average of an eight (8) hour shift.
- C. Terms and definitions
  - 1. Personal dust sampler - is a small device that is worn on the miner's clothing that is used to measure the amount of respirable dust in the working areas of the mine.
  - 2. Respirable dust - is the very fine particles of coal dust that can be carried by the air directly into the air sacs of the lungs.
  - 3. Ear plugs (ear muffs) - are personal protective devices designed to protect the workers' hearing against high-sound levels.
  - 4. Decibel - is a measure of loudness.

XXII. Dust control devices
- A. Secondary (auxillary) ventilation system
  - 1. Water sprays
  - 2. Dust fans (diffusers)
  - 3. Dust collectors
- B. Responsibilities
  - 1. You should never disconnect or dismantle any of these devices.
  - 2. If dust collection devices become damaged or defective, report this to your foreman so that they can be repaired.
  - 3. Also, if a ventilation curtain is knocked down near the face, replace the curtain at once.



Comparison of the average dust exposures relative to specific occupations in 29 selected mines

Incidence of Coal Workers Pneumoconiosis (Black Lung)



NOISE REGULATIONS

§ 70.501 Requirements.

Every operator of an underground coal mine shall maintain the noise levels during each shift to which each miner in the active workings of the mine is exposed at or below the permissible noise levels set forth in Table I of this subpart.

TABLE I - Permissible Noise Exposures

Duration per day (hours)	Noise Level (dBA)
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
3/4	107
1/2	110
1/4 or less	115

NOTE: No exposure shall exceed 115 dBA. Impact or impulsive noises shall not exceed 140 dBA, peak sound pressure level.

§ 70.506 Noise level measurement procedures.

(a) Noise level measurements shall be made at locations where the noise is typical of that entering the ears of the miner whose exposure is under consideration.

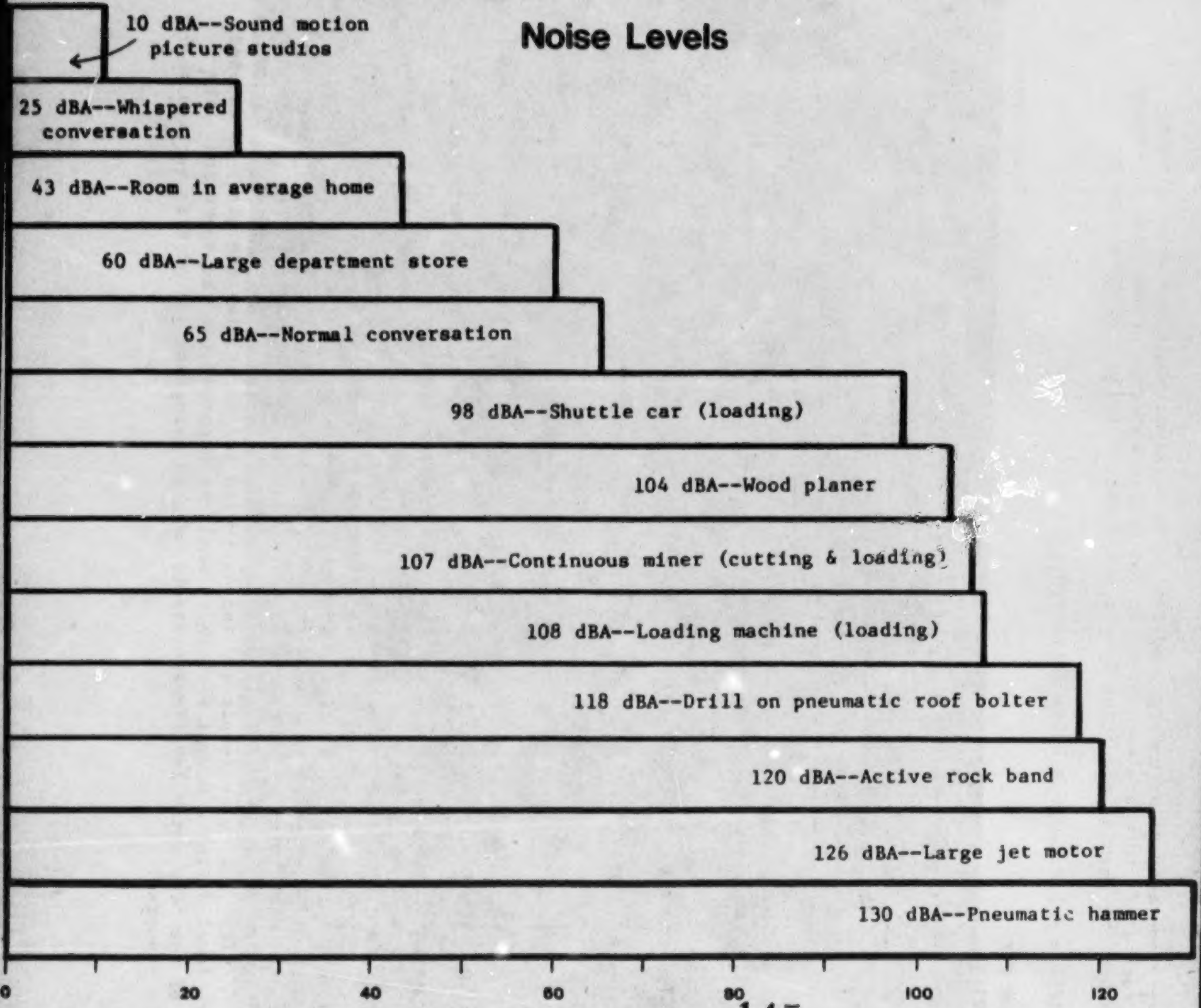
(b) Five measurements shall be made for each type of noise exposure producing operation to which the miner under consideration is exposed.

(c) Each measurement shall be made by observing the A--scale readings for 30 seconds and recording the noise level.

(d) The average of the five noise level measurements shall be considered as the noise level measurement which is representative of the operation.

(e) Where different and distinct noise levels occur at various phases of an operation, noise level measurements shall be made in accordance with this section for each distinct phase.

(f) The noise levels and the estimated length of time the miner is exposed to each level during a normal work shift shall be reported for the operation. The range of the five noise level measurements used in paragraph (d) of this section shall also be reported.


Noise Levels
10 dBA--Sound motion picture studios
25 dBA--Whispered conversation
43 dBA--Room in average home
60 dBA--Large department store
65 dBA--Normal conversation
98 dBA--Shuttle car (loading)
104 dBA--Wood planer
107 dBA--Continuous miner (cutting & loading)
108 dBA--Loading machine (loading)
118 dBA--Drill on pneumatic roof bolter
120 dBA--Active rock band
126 dBA--Large jet motor
130 dBA--Pneumatic hammer
0
20
40
60
80
100
120

XXIII. Sanitation Laws

A. Sanitary facilities

1. Above ground
    - a. Facilities to change clothes before and after your shift.
    - b. A locker or storage place to store your belongings while you are at work.
    - c. Bathing facilities where there is at least one (1) shower for each five (5) miners.
    - d. Toilet facilities where there is at least one (1) toilet for each ten (10) miners.
    - e. An adequate supply of toilet paper at each toilet.
    - f. Adequate hand washing facilities for each bath house.
    - g. Hot and cold running water must be provided.
    - h. The entire facility must have adequate heat, light, and ventilation to maintain a comfortable environment.
2. Below ground (underground)
    - a. Fresh (pottable) water in adequate amounts at the workings.
    - b. Sanitary toilet facilities located under protected roof in a dry area within five hundred (500) feet of each working place.
    - c. Each toilet facility shall have an adequate supply of toilet paper.

Glossary of Terms

Attenuating. weakening.

Black lung. a chronic disease of the lungs arising from the inhalation of sooty air.

Frequency. pitch (That is, the degree of highness or lowness of a sound.)

Intensity. power (in this case, of sound).

Pneumoconiosis. (see Black Lung).

Respirable dust. dust collected with an MRE instrument or any other dust sampling device approved by the Secretary and the Secretary of Health, Education and Welfare.

Respirator. a device for protecting the respiratory tract (as against irritating and poisonous gases, fumes, smoke, and dust) with or without equipment for supplying oxygen or air.

PART XIII

GASES

XXIV. Methane

A. Origin
  1. Methane is created as coal is formed by the decaying of plants and pressure.
B. Methane build-up
  1. Methane usually builds up in the cavities (fall-out) of the mine roof and poorly ventilated areas, especially within twelve (12) inches of the roof.
C. Characteristics
  1. Methane is highly explosive when mixed with air.
D. Explosive range
  1. Five (5) to fifteen (15) percent.
E. Detection
  1. Analyzer, detector, monitor, and a permissible flame safety lamp.
F. Removal
  1. The most common way to reduce or remove a dangerous methane concentration is to make the necessary changes or adjustments to the mine ventilation system.
G. Actions of the Federal Law
  1. One (1) percent methane concentration in face areas.
    a) Electrical power must be cut to the face equipment in that working place.
    b) Necessary changes or adjustments to the ventilation system to reduce the methane concentration below one (1) percent.
    c) Only qualified persons are permitted to return to the area before the methane concentration becomes less than one (1) percent.
  2. More than one (1) percent methane concentration at a face area.
    a) The area must be evacuated immediately.
    b) All electrical power must be cut off from that area (working station).
H. Types of methane detectors
  1. NMS G-70
  2. MSA 402
  3. MSA Permissible Methane Spotter
  4. Bacharach Permissible Methane Indicating Detector
I. Continuous monitors
  1. Location
    a) The indicator is mounted near the operator of the mining machine, and the sensing head is mounted on the front of the machine.
  2. Indications
    a) White light indicates that the monitor is on;
    b) Blue light indicates that the unit is not working properly;
    c) Yellow light indicates that one (1) percent or more of methane is in the air; and
    d) When red light comes on, the machine is automatically deenergized (shut off).
  3. Types of machines continuous monitors are located on:
    a) Continuous miners
    b) Loaders
    c) Cutters
    d) Longwall plows and shearers

J. Exceptions

1. There can be no explosion when the percentage of methane in the air is below five (5) percent because the heat liberated by combustion is dissipated (scattered) into the surrounding air sufficiently rapid to prevent propogation.
2. There can be no explosion when the percentage of methane in the air is above fifteen (15) percent because the amount of oxygen present is insufficient for rapid combustion.
3. If there is methane in the air, the flame of a permissible flame safety lamp may not be extinguished (go out) until the oxygen content of the air falls below thirteen (13) percent.

K. Terms

1. "Place" means the single face where the gas was detected.
2. Supplement means that something must be added to make up for a lack of.

Regulations

Oxygen

§75.303 Preshift examination.

(Statutory Provisions)

(a) Within 3 hours immediately preceding the beginning of any shift, and before any miner in such shift enters the active workings of a coal mine, certified persons designated by the operator of the mine shall examine such workings and any other underground area of the mine designated by the Secretary or his authorized representative. Each such examiner shall examine every working section in such workings and shall make tests in each such working section for accumulations of methane with means approved by the Secretary for detecting methane, and shall make tests for oxygen deficiency with a permissible flame safety lamp or other means approved by the Secretary.

§75.301 Air quality, quantity, and velocity.

All active workings shall be ventilated by a current of air containing not less than 19.5 volume per centum of oxygen...

§75.304 On-shift examinations for hazardous conditions.

At least once during each coal-producing shift, or more often if necessary for safety, each working section shall be examined for hazardous conditions by certified persons designated by the operator to do so...Such examinations shall include tests for methane with a means approved by the Secretary for detecting methane and for oxygen deficiency with a permissible flame safety lamp or other means approved by the Secretary.

Methane

§75.307 Methane examinations.

(Statutory Provisions)

At the start of each shift, tests for methane shall be made at each working place immediately before electrically operated equipment is energized. Such tests shall be made by qualified persons. If 1.0 volume per centum or more of methane is detected, electrical equipment shall not be energized, taken into, or operated in, such working place until the air therein contains less than 1.0 volume per centum of methane. Examinations for methane shall be made during the operation of such equipment at intervals of not more than 20 minutes during each shift...

§75.308 Methane accumulations in face areas.

(Statutory Provisions)

If at any time the air at any working place, when tested at a point not less than 12 inches from the roof, face, or rib, contains 1.0 volume per centum or more of methane, changes or adjustments shall be made at once in the ventilation in such mine so that such air shall contain less than 1.0 volume per centum of methane. While such changes or adjustments are underway and until they have been achieved, power to electric face equipment located in such place shall be cut off, no other work shall be permitted in such place, and due precautions shall be carried out under the direction of the operator or his agent so as not to endanger other areas of the mine. If at any time such air contains 1.5 volume per centum or more of methane, all persons, except those referred to in section 104(d)* of the Act, shall be withdrawn from the area...and all electric power shall be cut off from the endangered area of the mine, until the air in such working place shall contain less than 1.0 volume per centum of methane.

*miner working to correct hazard
public official required to enter the area (i.e., state mine inspector)
inspectors and miner representatives qualified to investigate the hazard
consultants

§75.309 Return air; tests and adjustments.

(Statutory Provisions)

(a) If, when tested, a split of air returning from any working section contains 1.0 volume per centum or more of methane, changes or adjustments shall be made at once in the ventilation in the mine so that such returning air shall contain less than 1.0 volume per centum of methane. Tests under this §75.309 shall be made at 4-hour intervals during each shift...In making such tests, such person shall use means approved by the Secretary for detecting methane.

(b) If, when tested, a split of air returning from any working section contains 1.5 volume per centum or more of methane, all persons except those persons referred to in section 104(d) of the Act, shall be withdrawn from the area...and all electric power shall be cut off from the endangered area of the mine, until the air in such split contains less than 1.0 volume per centum of methane.

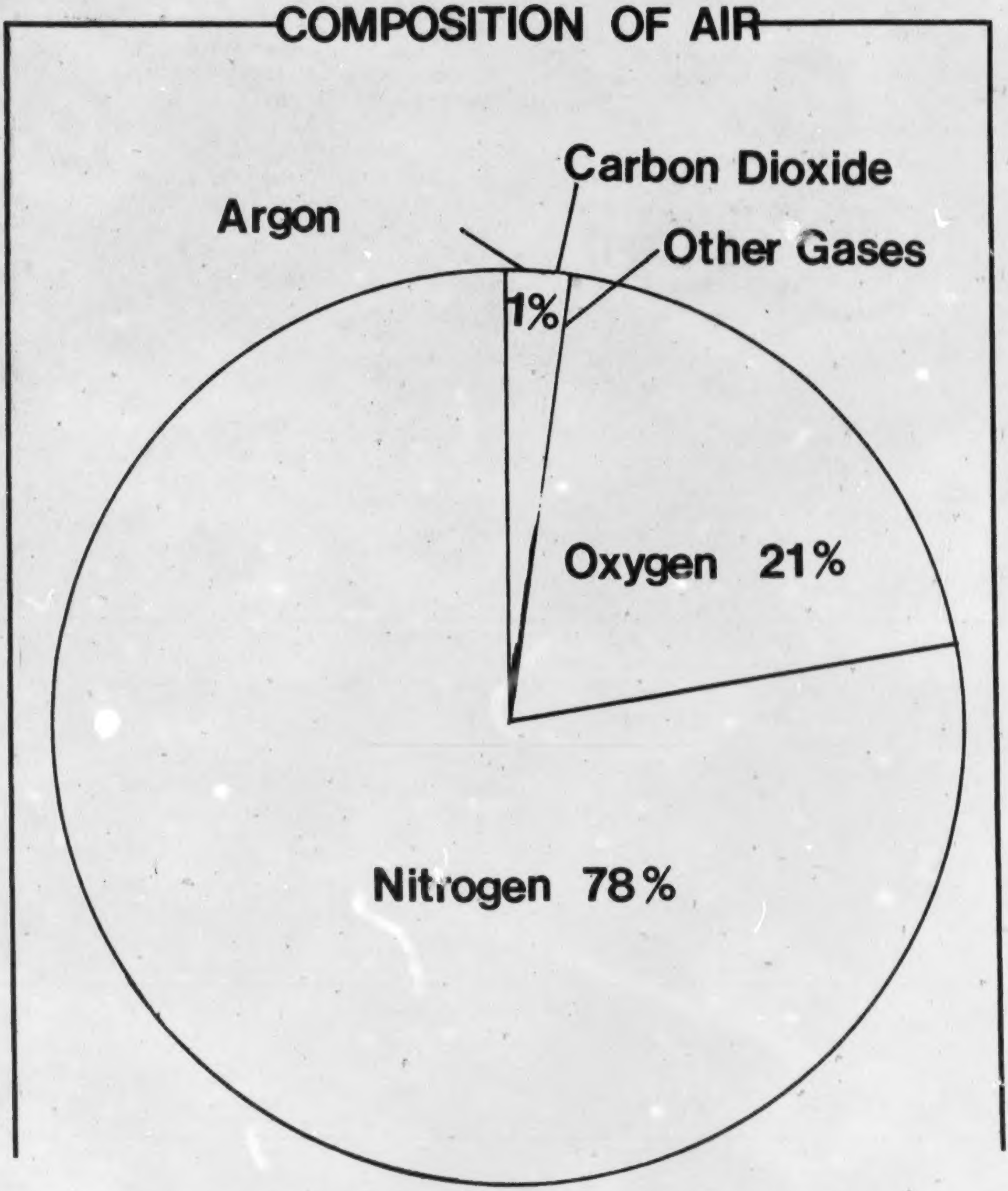
§75.307-1 Methane examinations at the face.

...On and after December 31, 1970, a methane detector approved by the Secretary shall be used for such tests and a permissible flame safety lamp may be used as a supplementary testing device.

XXV. Common Mine Gases and Damps

- A. Methane
  - 1. Methane is the most common gas in the mine atmosphere.
  - 2. Methane is highly explosive in relatively small concentrations; especially in the range of five (5) to fifteen (15) percent.
- B. Carbon monoxide
  - 1. Carbon monoxide is a product of incomplete combustion and is one of the most poisonous mine gases to be found in the mine atmosphere following an explosion or fire. In fact, .05 percent of carbon monoxide in the air can kill a person in three (3) hours.
  - 2. Also, carbon monoxide is explosive over a wide range; namely, 12.5 to 74 percent. The maximum explosive range being thirty-two (32) percent.
- C. Carbon dioxide
  - 1. Carbon dioxide is a product of complete combustion and is formed in relatively large quantities during fires, explosions, and other kinds of combustion.
  - 2. When oxygen is replaced by carbon dioxide and other gases following a mine explosion or fire, persons subjected to such atmospheres may die as a result of suffocation due to a lack of oxygen.
- D. Oxygen deficiency
  - 1. Oxygen deficiency is simply any mine atmosphere that is lacking in oxygen.
- E. Blackdamp
  - 1. Blackdamp is the gases that make up an oxygen deficient atmosphere.
  - 2. Blackdamp usually has more than the ordinary amounts of carbon dioxide and nitrogen and less than normal amount of oxygen. However, blackdamp can be formed by large amounts of methane being present in a close place.
- F. Firedamp
  - 1. Firedamp is any mixture of mine air that will burn or explode.
  - 2. Usually, methane and oxygen are the main gases in firedamp.

COMPOSITION OF AIR



Degree of Activity	Respirations per minute	Air inhaled per respiration [CUBIC INCHES]	Air inhaled per minute [CUBIC INCHES]	Oxygen consumed per minute [CUBIC INCHES]
AT REST	16	30	480	20
MODERATE EXERCISE	30	100	3000	120
VIGOROUS EXERCISE	40	150	6000	240

APPROXIMATE RATE AND VOLUME OF RESPIRATION
AND OF OXYGEN CONSUMPTION BY HUMANS

Effects of Oxygen Deficiency

OXYGEN PRESENT	EFFECT
21%........................	Breathing easiest
19.5%......................	Minimum requirement by law
19%........................	Flame safety lamp gives about one-third the light it gives in normal air (if the atmosphere is methane-free).
17%........................	Breathing becomes faster and deeper
16.25%.....................	Flame safety lamp extinguishes in a methane-free atmosphere
16-13%.....................	Dizziness, buzzing noise, rapid pulse, headache, blurred vision
12.1%......................	Flame safety lamp extinguishes even if methane is present
9%.........................	May faint or become unconscious
6%.........................	Movement convulsive, breathing stops, shortly after the heart stops

XXVI. Flame safety lamp

- A. Purpose
  - 1. In most mines, the flame safety lamp is used as the primary (main) way of detecting an oxygen deficiency of blackdamp, and
  - 2. As a secondary way of detecting methane.
- B. Types
  - 1. Koehler, and
  - 2. Wolf
- C. History and Theory
  - 1. The flame safety lamp operates on a principle credited to Sir Humphrey Davey more than a century ago. Davy found that when a metal screen and gauze were placed over a flame, it (flame) would not pass through the gauze. The wire gauze safely confined the flame by rapidly dissipating the heat; thus reducing the temperature of the flame below ignition level.
- D. Conditional use
  - 1. The two (2) permissible types of lamps are safe to use under all conditions, provided, they are properly assembled with permissible parts and used by a qualified person.
- E. Major parts
  - 1. Fount assembly
    - a) Fuel storage area
    - b) Igniter assembly
    - c) Wick assembly and wick
    - d) Wick adjustment knob
    - e) Lower gauze ring
  - 2. Globe assembly
    - a) Asbestos gaskets (upper and lower)
    - b) Globe
    - c) Globe ring
  - 3. Bonnet assembly
    - a) Hood and bonnet
    - b) Outer gauze
    - c) Inner gauze
    - d) Expansion ring
    - e) Baffle ring
    - f) Magnetic lock
    - g) Standards
- F. Disassembly
  - 1. Sequence
    - a) Place a magnet on the two (2) lock pins of the magnetic locking device and unscrew the bonnet from the fount.
    - b) Turn the bonnet in a clockwise direction until a click is heard. The clock indicates that the lock is free and the magnetic lock is open.
    - c) Unscrew the bonnet in a counter clockwise direction, continuing to hold the magnet on the two (2) lock pins, until the bonnet and fount are separated.
    - d) The expansion ring will remain between the standards.
    - e) Remove the inner and outer gauzes.
    - f) Remove the gasket ring, globe, lower gauze ring, and gaskets.

G. Cleaning, filling, and inspecting

1. All deposits should be removed from the igniter file wheel. The igniter should be tested and adjusted to provide adequate sparking.
2. The wick raising device should be inspected and charred material cleaned from the wick.
3. To fill the lamp, remove the filler plug and fill the fount with a high grade of naptha. Fill the fount sufficiently to completely saturate the cotton packing and wick. Replace the filling, tighten adequately, and properly seat it against the filling plug gasket.
4. To clean the inner, outer, and lower gauzes, brush with a soft, brass, bristle brush or blow with low compressed air. The gauzes should be examined for broken wires and enlarged or obstructed holes.
5. Clean the globe thoroughly. It should be examined for defects (cracks or chipped edges).
6. Clean the dust and soot off bonnet assembly and carefully examine for defects.
7. Carefully inspect the asbestos gaskets for possible defects and breaks. Defective or doubtful gaskets should be replaced.

H. Assembly

1. Sequence
   - a) Begin with the fount assembly, which has been properly filled with a suitable fuel, thoroughly cleaned, and thoroughly examined for permissibility and for proper working conditions.
   - b) Insert an asbestos gasket in the lower gauze ring and properly set it in place on the fount.
   - c) Place the globe in its proper position.
   - d) Insert an asbestos gasket in the gasket ring and place it over the globe.
   - e) Place the inner and outer gauze over the globe.
   - f) Insert the expansion ring between the standards of the bonnet assembly.
   - g) Place bonnet assembly, with expansion ring in place, over the gauzes.
   - h) Screw bonnet assembly to fount threads in a clockwise direction until tight. A proper test for tightness is to grasp the globe with the thumb and first two (2) fingers and turn. The globe should turn with resistance.

I. Preliminary test

1. The unlighted lamp is placed in a lamp-testing box containing an explosive mixture of gas and air.
2. The igniter of the lamp is then operated to fire the mixture which has entered the lamp.
3. If the lamp is defective or improperly assembled, the explosion inside the lamp will ignite the gas-air mixture surrounding the lamp causing the rupture of a paper diaphragm at the top of the testing box.

J. Lighting and flame adjustments

1. Once the lamp has been determined to be permissible, it should be lit and the flame adjusted in an atmosphere free of methane.

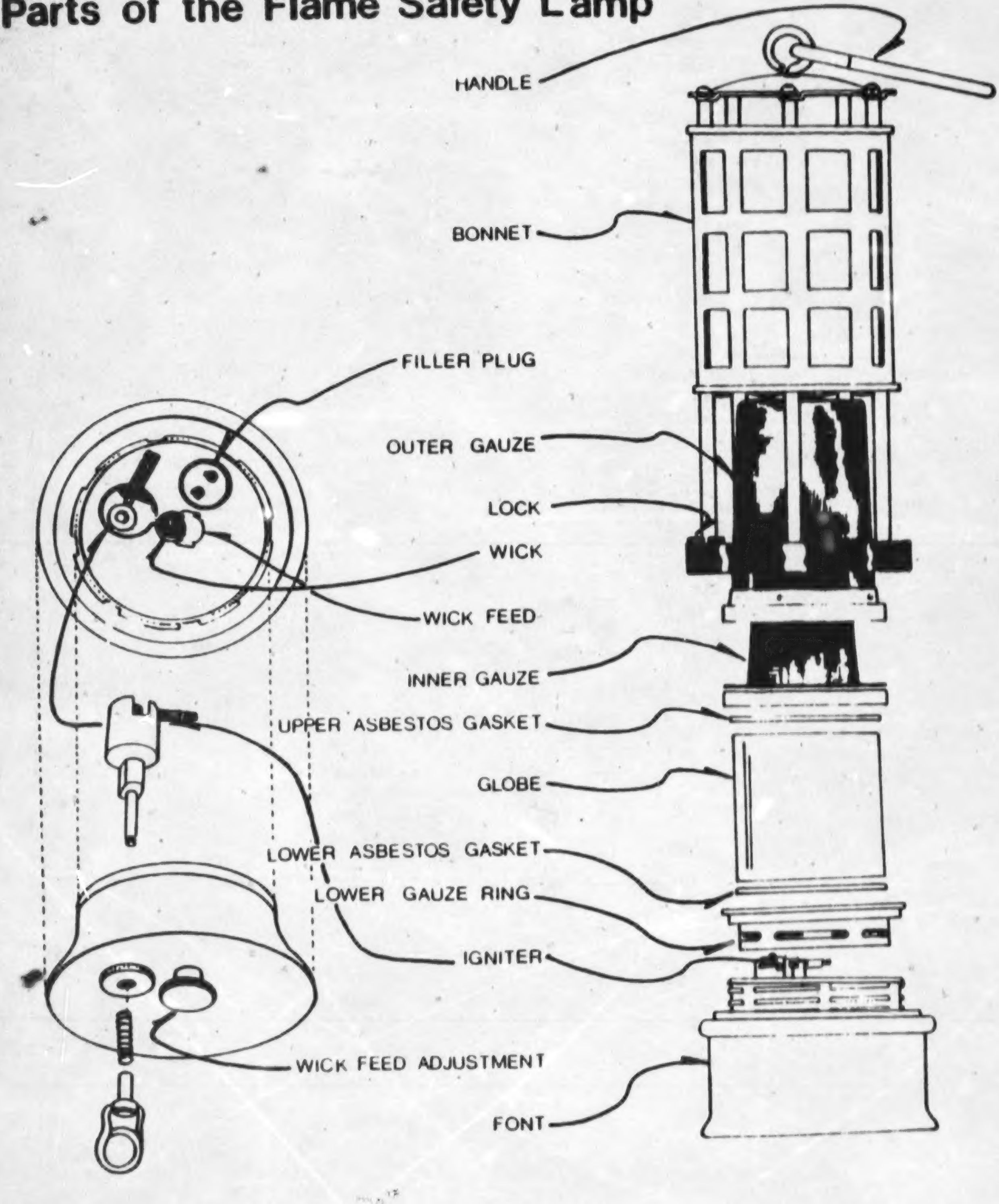
2. Procedure
   a) Extend the wick.
   b) Elevate the igniting device.
   c) Rotate the igniter until a spark is produced.
   d) Adjust the wick for the desired height of the flame.

K. Testing for methane
1. Hold firmly in upright position.
2. Determine test area.
3. Raise lamp slowly.
4. Observe action of flame.
5. Withdraw lamp slowly.

L. Flame heights
1. Methods
   a) Traveling flame
      1. The height of the flame should be adjusted in fresh air to the highest practical height (one-inch for koehler).
      2. Actions of flame height
         a) No reaction indicates a safe, normal atmosphere.
         b) Initial elongation of flame, and then lowers in height and becomes paler or goes out, indicates an oxygen deficient atmosphere.
         c) Flame lengthens and becomes brighter (intensity) indicates a methane containing atmosphere.
      3. Disadvantage
         a) Height of flame must be adjusted in fresh air.
         b) "Cap" flame method
            1. Lower the wick until only a small, blue cap flame remains at its top.
            2. Complete darkness is required for this method since the pale blue flame elongation is quite difficult to see. The rise of the cap is the measure of methane conent in the air.
            3. Advantages
               a) Adjustment of flame height does not have to be made in fresh air.
               b) Accuracy and safety are greatly increased by the use of this method.
               c) Concentrations as low as 0.5 percent (%) per volume are readable when using the "cap" flame method.

M. Testing responsibility
1. Men charged with the responsibility of detecting methane should be thoroughly experienced and competent in the use and care of the lamps and should be checked for good eyesight and color perfection.

Parts of the Flame Safety Lamp


HANDLE
BONNET
FILLER PLUG
OUTER GAUZE
LOCK
WICK
WICK FEED
INNER GAUZE
UPPER ASBESTOS GASKET
GLOBE
LOWER ASBESTOS GASKET
LOWER GAUZE RING
IGNITER
WICK FEED ADJUSTMENT
FONT

XXVII. Methane testing responsibility
- A. Methane testing schedule
  - 1. Purpose
    - a) To insure that there is no methane buildup in working areas of coal mines, there must be a schedule for making gas tests and designated people to make those tests.
  - 2. Requirements
    - a) It is a requirement of Title 30 CFR Part 75, that each person whose duties require him to test for methane or oxygen deficiency receive annual training in performance of these tasks and duties, and annual retraining thereafter.
  - 3. Gas tests
    - a) The first checks for gas at every mine are made before each shift by a mine examiner called a fire boss.
  - 4. Preshift examiner (fire boss)
    - a) Duties
      - 1. The fire boss checks for methane, oxygen deficiency, and other unsafe conditions in the mine.
      - 2. He (fire boss) must report that the mine is safe before the miners on a shift can enter the mine.
  - 5. Mine foreman or section boss
    - a) Duties
      - 1. After the miners on a shift get into the mine, the section boss or mine foreman must check for explosive gas and oxygen deficiency.
  - 6. Operator of face equipment
    - a) Duties
      - 1. Usually the section boss checks the working faces before the crew goes to work. However, the operator of each piece of face equipment should check for gas before turning his equipment on.
    - b) Intervals
      - 1. While he/she is working, each equipment operator should check for gas every twenty (20) minutes, even though the machine may be equipped with a continuous monitor.
    - c) Other face areas
      - 1. When a machine operator trams his machine to another face, he should make the test for gas before he brings the machine past the last crosscut, or breakthrough, near the face.

GLOSSARY OF TERMS

Active workings. Any place in a mine where miners are normally required to work or travel.

Air shaft. A shaft used exclusively for conducting air.

Air split. The division of a current of air into two or more parts.

Airway. Any passage through which air is carried.

Auxiliary ventilation. Portion of main ventilating current directed to face of dead end entry by means of an auxiliary fan and tubing.

Belt or belt conveyor. A looped belt on which coal or other material can be carried and which is generally constructed of flame-resistant material.

Brattice or brattice cloth. Fire-resistant fabric or plastic partition used in a mine passage to confine the air and force it into the working place. Also termed "line brattice," "line canvas," or "line curtain."

Breast. Working place in an anthracite mine.

Check curtain. Sheet of brattice cloth hung across an airway to control the passage of the air current.

Coal dust. Particles of coal that can pass a No. 20 sieve.

Conveyor. An apparatus for moving material from one point to another in a continuous fashion. This is accomplished with an endless (that is, looped) procession of hooks, buckets, wide rubber belt, etc.

Crosscut. A passageway driven between the entry and its parallel air course or air courses for ventilation purposes. Also, a tunnel driven from one seam to another through or across the intervening measures; sometimes called "crosscut tunnel." In vein mining, an entry perpendicular to the vein.

Diffusion. Blending of a gas and air, resulting in a homogeneous mixture. Blending of two or more gases.

Diffuser fan. A fan mounted on a continuous miner to assist and direct air delivery from the machine to the face.

Dilute. To lower the concentration of a mixture; in this case the concentration of any hazardous gas in mine air by addition of fresh intake air.

Drift (coal). Any entry above water level and generally on the slope of a hill, driven horizontally into a coal seam.

Entry. An underground passage used for haulage, ventilation, or as a manway; a coal heading; a working place where the coal is extracted from the seam in the initial mining.

Safety lamp. A lamp of an approved type which is relatively safe to use in an atmosphere which may contain explosive gases and is used primarily for the detection of oxygen deficiency and may be used as a supplementary device for the testing of methane.

Velocity. Rate of air flow in lineal feet per minute.

Violation. The breaking of any State or Federal mining law.

Working face. Any place in a mine where material is extracted from its natural deposit during a mining cycle.

Working place. From the inby side of the last open crosscut to the face.

Working section. From the faces to the point where coal is loaded onto belts or rail cars to begin its trip.

PART XIV

STATUTORY RIGHTS AND OBLIGATIONS

MINERS' RIGHTS AND OBLIGATIONS

LAWS GOVERNING THE MINING OF COAL AND CLAY
KENTUCKY REVISED STATUTES
Chapters 351-352
Amended 1976

351.030 (1) Hearings before department.

The department may prescribe rules of procedure and for offering evidence in all matters brought before it, and shall prepare and, on request, furnish to applicants copies of forms of notices and other forms that the department requires to be used, and shall prescribe the manner of serving such notices.

351.040 (1) Action to vacate order of department; appeal.

Any party in interest dissatisfied with an order of the department may commence an equitable action against the department and other interested parties as defendants, to vacate or set aside, in whole or in part, any such order. The action may be brought in the circuit court of the county where the subject matter involved in the order, or the well or workable coal bed or part thereof, is located. The court may grant relief from any unlawful or unreasonable order of the department, and render such judgment as appears to it to be equitable and just.

351.102 (1) Certificate of competency and qualification; examination appeals. No person shall be assigned to work duties by an operator as a laborer or supervisor working underground for the purpose of mining coal unless the person holds a valid certificate of competency and qualification or a valid permit as trainee issued in accordance with this section.

(10) Any applicant aggrieved by an action of the commissioner in failing or refusing to issue a certificate of qualification and competency may, within ten (10) days of notice of the action complained of, appeal to the commissioner who shall within ten (10) days of the appeal give the applicant a hearing and either affirm the action or issue the certificate to the applicant.

351.103 Eligibility of mining.

Supervisory, clerical, and technically-trained employees of the mine operator whose work contributes only indirectly to mine operations shall not be required to possess a miner's certificate of competency and qualification.

351.104 Certification of miners employed prior to date of training program establishment.

The board of miner training, education, and certification established by KRS 315.105 shall establish the date on which the training program for underground miners as required by KRS 351.102 is sufficiently available for the work force in all of the state.

351.105 (19) Board of miner training, education and certification.

The board may, upon its own motion or whenever requested to do so by the commissioner, deem applicable certificates issued by other states to be proof of training and education equal to the requirements of KRS 351.102 or deem training provided by appropriate federal agencies to be adequate to meet training and education requirements set by the board, provided that the training and education meet the minimum requirements of this chapter.

351.107 (1) Requirements for certification as shotfirer.
No person shall detonate explosives within a mine unless that person successfully has completed a training program and has passed a test administered by the commissioner or his representative. Such a test shall include at a minimum a determination of the person's ability to test for mine gases and to safely detonate explosives in an underground coal mine.

351.108 Superintendent to hold a mine foreman certificate.
Mine superintendents directly involved in the production of coal shall hold a mine foreman certificate.

351.109 (1) Requirements for qualification or certification to perform electrical work; written tests.

(a) He has at least one (1) year of experience in performing electrical work underground in a coal mine, in the surface work areas of an underground coal mine, in a surface coal mine, in a non-coal mine, in the mine equipment manufacturing industry, or in any other industry using or manufacturing similar equipment, and he attains a satisfactory grade on each of the series of five (5) written tests administered by the department.

(b) An individual may, within thirty (30) days from the date on which he received notification from the department of his test scores, repeat those on which he received an unsatisfactory score. If further retesting is necessary after this initial repetition, a minimum of thirty (30) days from the date of receipt of notification of the initial retest scores shall elapse prior to such further retesting.

(c) An individual qualified or certified in accordance with this section shall, in order to retain qualification of certification, satisfactorily complete a retraining program annually.

351.120 (6) Certificates, how granted; form and content; classifications; duty of applicant.
No certificate shall be granted to any person who does not present to the board satisfactory evidence, in the form of affidavits made by well known and responsible persons in the locality from which he came, that the applicant is a man of sobriety and good moral character, and that he has had the required practical experience in underground coal or clay mines, or to any person who is not either a bona fide resident of this state or employed at an underground mine in this state. A data sheet must be filed by each applicant showing places of employment, beginning month and year and ending month and year employed by each company and list jobs performed, showing at least the number of required years. Affidavit and data sheet forms will be furnished by the department. A degree in mining engineering from a recognized institution of learning may be taken as the equivalent of two (2) years of mining experience. Persons desiring to use their mining engineering degree for two (2) years' experience credit toward either the assistant mine

foreman or mine foreman certificate shall file a certified copy of their grades and proof of having received their degree prior to the examination. A minimum of five (5) years' underground experience is required of applicants for mine foreman certificates and a minimum of three (3) years' underground experience is required of applicants for assistant mine foreman and fire boss certificates.

351.125 First-aid training.

The department shall provide first-aid training incorporating all training required by the state's approved program for emergency medical technicians which is applicable for underground coal mines. Each candidate for certification as a mine foreman shall complete the department's first-aid course of instruction and shall pass an examination on the course as a prerequisite for certification. The course of instruction and examination shall have prior approval of the board.

351.100 Abandoned mine not to be entered; exception.

No person shall attempt to enter, explore or survey an abandoned mine or portion thereof without the approval of the mine inspector or the commissioner.

352.130 (4) Hoisting devices in shafts, regulation concerning.

No person shall ride on any cage when coal, slate or similar material is being raised.

352.150 Provisions concerning haulage roads, transportation of men, and first-aid equipment.

Men shall not load or unload before the cars in which they are to ride or are riding come to a full stop, and men shall proceed in an orderly manner to and from man-trips.

352.170 Safety and electric lamps, when required; other lights and fires forbidden.

No person shall at any time carry into any mine any intoxicants. No person shall at any time enter any underground mine with matches, pipes, cigars, cigarettes or any device for making lights or fire not authorized or approved, and the operator shall at frequent intervals search, or cause to be searched, any person entering or about to enter the mine, or inside the mine, to prevent such person from taking, carrying or using the articles therein.

352.210 Conduct in mine.

No person shall knowingly injure any shaft, lamp, instrument, air course, or brattice, obstruct or throw open airways, distrub any part of the machinery or appliances, open a door used for directing ventilation without closing it afterwards, enter any part of a mine against caution, disobey any order given in carrying out any of the provisions of KRS Chapter 351 or 352, do any act endangering the life or health of any person employed in the mine or in hampering the security of the mine. No person shall enter or be on any mine property while intoxicated or under the influence of alcohol or a controlled substance. No alcoholic beverage or controlled substance shall be permitted in or about the mine; provided, however, this shall not apply to private vehicles driven to and from the mine.

Before the rules are so adopted, approved and posted, the representative of the employees at the mine shall be given a copy thereof, and be deemed to have agreed thereto, before the employees are required to obey such rules.

352.440 Appeal by miners from inspection by mine inspector.
If seventy-five percent (75%) of the employees of any mine are dissatisfied with the inspection of the mine made by a mine inspector, they may appeal in writing to the department, setting forth clearly and in detail the reasons for their dissatisfaction. The commissioner of the department shall carefully consider the appeal and promptly take action by ordering another inspection to be made by the mine inspector, either alone or in company with another mine inspector detailed by the commissioner for the purpose, if that course appears to him to be warranted by the facts set forth in the appeal, or the commissioner may take such other action as appears to him just and proper. The appeal shall be signed by the dissatisfied person.

352.480 (2) Duplicate maps; survey of abandoned or closed mine.
No copy of such a map shall be made without consent of the owner, lessee or operator, except that when the owner of any land adjacent to or near the land of the owner, lessee or operator files an affidavit with the commissioner showing ownership of the adjacent or nearby property, and alleging that he believes that the owner, lessee, or operator is encroaching upon or mining on his property, the commissioner shall cause to be furnished to the affiant, at the expense of the affiant, a duplicate of the map filed by the owner, operator, or lessee.

352.40 (1) Mine not to extend within twenty-five (25) feet of property line; liability for damages.

No owner or tenant of any land containing coal or clay shall engage in underground mining within twenty-five (25) feet of the line dividing the mineral owned or held by him from that of another person, without the written consent of every person interested in or having title to the adjoining land in possession, reversion or remainder, or the guardians of such of those persons as are infants. The owner or tenant must also have the approval of the commissioner.

352.520 (1) Mine scales.
The operator or superintendent of each mine shall provide at the tipple or dumping point of the mine suitable and accurate scales for the weighing of coal or clay for which the miners are to be paid, and when differences arise between the operator or superintendent of the mine and the miners as to the accuracy or capacity of the scales and such differences cannot be adjusted locally the question shall be referred to the Department of Mines and Minerals. The department shall inspect and test the scales as early as practicable after receiving notification. If the inspecting officer of the department finds the scales inaccurate or defective

beyond the limit permitted by the department, he shall notify the operator or superintendent of the mine, and the scales shall immediately be repaired and made accurate or accurate scales substituted therefor. If the inspecting officer finds the scales to be weighing within the limits prescribed by the department, he shall so advise the operator, the superintendent and the representative of the miners in a manner prescribed by the commissioner of the department.

352.530 (1) Check weighman.
When a majority of the miners in any mine request the operator of the mine to allow the miners to employ at their own expense a check weighman to inspect the weights at the mine, and see that all coal or clay mined is properly weighed and accounted for, and perform only such other duties as will insure that the coal or clay is properly weighed and correctly accounted for, the operator shall permit a check weighman to be employed by the miners making the request, provided the person so employed has the reputation of being an honest, trustworthy, discreet, sober and upright man. The check weighman shall be an employee of the mine, unless no employee is a suitable person, in which case the miners may, by agreement with the operator, elect some other person who is suitable. No check weighman shall hold any other offices or have any other duties than as check weighman. The check weighman shall be elected by a majority of the employees engaged in mining and loading coal or clay and the election shall be properly conducted by secret ballot at the principal entrance to the mine. The election of each check weighman shall be approved by the county judge of the county, on presentation of an affidavit stating that the check weighman has been duly and properly elected in accordance with the provisions of this section.

352.540 Payment of miners.
All persons employing persons in mining work shall, on or before the fifteenth and thirtieth days of each month pay to each employee, within fifteen (15) days of the aforesaid fifteenth or thirtieth day, respectively, in lawful money of the United States, the full amount of wages due him, unless prevented by an unavoidable casualty. If, at any time of payment, the employee is absent from his place of labor, he shall be entitled to such payment at any reasonable time thereafter on demand.

CODE OF FEDERAL REGULATIONS #30

75.160-1 Plans for training programs.
On or before December 31, 1970, each operator shall submit to the District Manager a program or plan setting forth what, when, how, and where he will train and retrain persons whose work assignments require that they be certified or qualified. Such program shall provide: (a) For certified persons, annual training courses in methane measurement and oxygen deficiency testing, roof and rib control, ventilation, first aid, principles of mine rescue, and the provisions of this Part 75, and (b) for qualified persons, annual courses in performance of the tasks which they perform as qualified persons.

75.200-14 Criteria - roof support recovery.
Any operator who intends to recover roof supports should include a detailed plan for such recovery.

75.1403-5 (J) Criteria - Belt Conveyors
Persons should not cross moving belt conveyors, except where suitable crossing facilities are provided.

75.1403-10 (D) Criteria - Haulage; general.
No person, other than the motorman and brakeman, should ride on a locomotive unless authorized by the mine foreman, and then only when safe riding facilities are provided. No person should ride on any loaded car or on the bumper of any car. However, the brakeman may ride on the rear bumper of the last car of a slow moving trip pulled by a locomotive.

75.1702 Smoking; prohibition.
No person shall smoke, carry smoking materials, matches, or lighters underground, or smoke in or around oil houses, explosives magazines, or other surface areas where such practice may cause a fire or explosion. The operator shall institute a program, approved by the Secretary, to insure that any person entering the underground area of the mine does not carry smoking materials, matches, or lighters.

75.1703 Portable electric lamps.
Persons underground shall use only permissible electric lamps approved by the Secretary for portable illumination. No open flame shall be permitted in the underground area of any coal mine, except as permitted under 75.1106.

75.1712 Bath houses and toilet facilities.
The Secretary may require any operator to provide adequate facilities for the miners to change from the clothes worn underground, to provide for the storing of such clothes from shift to shift, and to provide sanitary and bathing facilities. Sanitary toilet facilities shall be provided in the active workings of the mine when such surface facilities are not readily accessible to the active workings.

75.1712-2 Location of surface facilities.
Bathhouses, change rooms, and sanitary toilet facilities shall be in a location convenient for the use of the miners. Where such facilities are designed to serve more than one mine, they shall be centrally located so as to be as convenient for the use of the miners in all the mines served by such facilities.

75.1712-6 Underground sanitary facilities; approved sanitary toilets; installation and maintenance.
Except as provided in 75.1712-7, each operator of an underground coal mine shall, on and after December 30, 1970, provide and maintain one approved sanitary toilet, together with an adequate supply of toilet tissue, in a dry location under protected roof, within 500 feet of each working place in the mine where miners are regularly employed during the mining cycle. A single approved sanitary toilet may serve two or more working places in the same mine, if it is located within 500 feet of each such working place.

75.1712-8 Application for waiver of location requirements for underground sanitary facilities.
Applications for waivers of the location requirements of 75.1712-6 shall be filed with the Coal Mine Safety District Manager and shall contain the following information:

- (a) The name and address of the mine;
- (b) The name and location of the mine;
- (c) The thickness of the coal seam in each working place in the mine for which a waiver is requested; and
- (d) Other physical restrictions in the mine (for example, poor roof conditions, excessive water, timbering, etc.)

If a sanitary toilet cannot be installed within 500 feet of a working place because of physical conditions other than the thickness of the coal seam, the operator shall also include a short statement specifying areas in the mine which could be considered possible alternative sites for installation of such facilities.

75.1712-10 Underground sanitary facilities; maintenance.
Sanitary toilets shall be regularly maintained in a clean and sanitary condition. Holding tanks shall be serviced and cleaned when full and in no case less than once each week by draining or pumping or by removing them to the surface for cleaning or recharging. Transfer tanks and transfer equipment used underground shall be equipped with suitable fittings to permit complete drainage of holding tanks without spillage and allow for the sanitary transportation of wastes to the surface. Waste shall be disposed of on the surface in accordance with State and local laws and regulations.

75.1713 Emergency medical assistance; first-aid.
Each operator shall make arrangements in advance for obtaining emergency medical assistance and transportation for injured persons. Emergency communications shall be provided to the nearest point of assistance. Selected agents of the operator shall be trained in first-aid and first-aid training shall be made available to all miners. Each coal mine shall have an adequate supply of first-aid equipment located on the surface

at the bottom of shafts and slopes, and at other strategic locations near the working faces. In fulfilling each of the requirements of this section, the operator shall meet at least minimum requirements prescribed by the Secretary of Health, Education, and Welfare.

75.1713-1 (a) Arrangements for emergency medical assistance and transportation for injured persons, agreements, reporting requirements, posting requirements.

Each operator of an underground coal mine shall make arrangements with a licensed physician, medical service, medical clinic, or hospital to provide 24-hour emergency medical assistance for any person injured at the mine.

75.1713-2 (a) Emergency communications; requirements

Each operator of an underground coal mine shall establish and maintain a communication system from the mine to the nearest point of medical assistance for use in an emergency.

75.1714 Self-rescue device.

A self-rescue device approved by the Secretary shall be made available to each miner by the operator which shall be adequate to protect each miner for 1 hour or longer. Each operator shall train each miner in the use of such a device.

75.1720 Protective clothing; requirements.

On and after the effective date of this 75.1720 each miner regularly employed in the active workings of an underground coal mine shall be required to wear the following protective clothing and devices:

(a) Protective clothing or equipment and face-shields or goggles when welding, cutting, or working with molten metal or when other hazards to the eyes exist from flying particles.

(b) Suitable protective clothing to cover those parts of the body exposed to injury when handling corrosive or toxic substances or other materials which might cause injury to the skin.

(c) Protective gloves when handling materials or performing work which might cause injury to the hands; however, gloves shall not be worn where they would create a greater hazard by becoming entangled in the moving parts of equipment.

(d) A suitable hard hat or hard cap. If a hard hat or hard cap is painted, nonmetallic based paint shall be used.

(e) Suitable protective footwear.

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